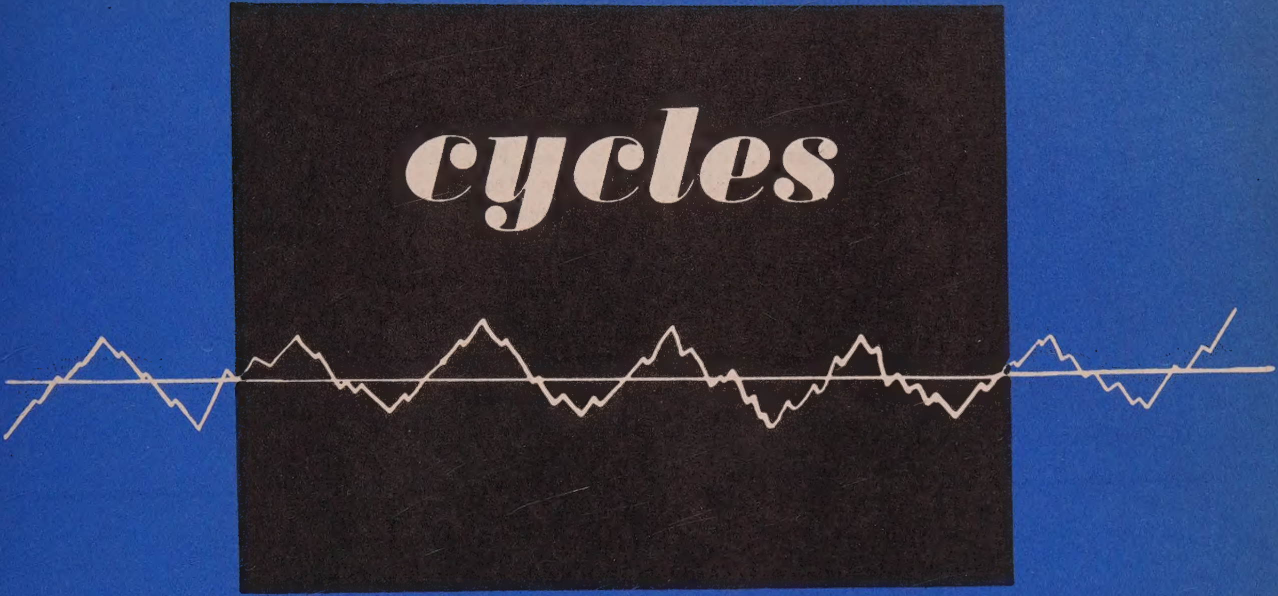

cycles

June – July 1955

FOUNDATION FOR THE STUDY OF CYCLES
New York, New York

CONTENTS

Page

DIRECTOR'S LETTER 167

RESEARCH

The 6-Year Cycle in Steel Production, 1867—1954 169
Global Patterns of Cycles in Temperature 175
The 16- or 16 2/3-Year Cycle in Coffee Prices, 1854—1954 . . 180
The 15 1/7-Year Cycle in Black Pepper Prices, 1819—1953 . . 184
The 4-Year Cycle in Sunspot Numbers With Alternate Cycles Reversed, 1749—1954 186
The 4-Year Cycle in the Consumption of Cheese, 1867—1953 . . 188

HOW IT CAME OUT

The 6-Year Cycle in Standard Oil of California 190
The 6-Year Cycle in Swift and Company Sales 192

THE MODIFIED GEISINGER INDICATOR OF INDUSTRIAL PRODUCTION . . . 194

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cycles

The official Bulletin of the Foundation for the Study of Cycles

VOLUME VI NUMBER 6 JUNE – JULY 1955

The Director's Letter

Dear Member:

You may enjoy, as I did, the following letter:

Gentlemen:

When I sent my check to you for subscription to this CYCLE business I did not realize that I had to buy a library and enter a class in economics and go back to school.

At the age of seventy-nine I am looking for more leisure and less agony.

Therefore, you may discontinue sending material, although I have received only one crystal ball to date.

Yours truly,
A. J. Jungerman
Louisville, Kentucky

Mister, talk about agony and lack of leisure! You ought to have to do the research and write the stuff!!!

The Crystal Ball

Additional figures which have become available since our May report went to press enable me to give you revised values for our crystal ball department (The Modified Geisinger Indicator of Industrial Production). The revised values suggest strength for the Federal Reserve Index of Industrial Production into the 4th quarter of this year.

As I think you know, the Modified Geisinger Indicator of Industrial Production is not a cycle forecast, but it works the way it does in part because there are cycles and because they behave the way they do.

The Sixth Year for *Cycles*

This issue marks the beginning of the sixth year of *Cycles*. Since June of 1950 I have prepared 1882 pages for your edification, amusement, frustration, and/or what have you.

Throughout this period I have had one underlying purpose. This purpose has been to show that the field of cycles is a subject with mysteries worthy of further investigation.

What causes the abundance of Canadian lynx to fluctuate in a cycle 9.6 years long? What causes steel production to evidence a 6-year cycle? What causes earthquakes to be more numerous at 35.2-year intervals? What causes international battles to tend to be more numerous every 22 1/7 years?

What causes cycles to be so prevalent?

What causes cycles to continue to keep on coming true for twenty, forty, sixty years after discovery?

What causes cycles in different things to have the same wave lengths?

And, when cycles have the same wave length, what causes crests of each to come at more or less the same calendar time?

What causes cycles of the same wave length in the same phenomenon (temperature for example, or the abundance of a certain kind of bird) to crest at the same calendar time near each pole, and then, *in each hemisphere* to crest later and later as we find the phenomenon nearer and nearer the equator? There is a name for this behavior--latitudinal passage, but what *causes* it?

What causes the variation from ideal latitudinal passage to conform to the variations of magnetic declination?

What causes cycles to evidence "beat"--a characteristic of electromagnetic waves?

What causes some cycles to have wave lengths which are simple multiples or simple fractions of the wave lengths of other cycles?

One answer could be "Chance." In many cases this is doubtless the true explanation. But can *all* this behavior be laid to chance? I do not think so.

In the five years I have been at work on this project, I think I have made a pretty good case for the thesis that cycles offer a mystery requiring solution. As Dr. Brooks said at a recent meeting where Dr. Abbot presented a paper, "We must either prove that these things are not so, or we must find the cause."

That's the job for the *next* five years!

Cordially yours,

Edward R. Dewey

Director

Research

THE 6-YEAR CYCLE IN STEEL PRODUCTION, 1867–1954

THE production of steel ingots and castings from 1867 through 1954 has been characterized by a 6-year rhythm. This rhythm has repeated enough times and with enough regularity so that it cannot easily be the result of random forces.

If you determine the typical or average ("ideal") cycle you find that the crest of the current wave was due midway between 1953 and 1954, the trough will be due midway between 1956 and 1957, the next crest will be due midway between 1959 and 1960. The strength of the cycle, typically, is 109.6% of trend at time of crest, 91.2% of trend at time of trough. Of course no one expects the ideal to happen, except occasionally. The ideal merely expresses a tendency, just as the coldest day of the year *tends* to fall on February 1st, but usually doesn't.

The typical and the ideal 6-year cycles are plotted below as Fig. 1.

Steel production is rather complex. The 6-year cycle is only one of many tendencies. However, the 6-year cycle is strong enough so that it can be seen by inspection of the actual figures, plotted on ratio scale as in Fig. 2.

It can be seen better if we express the actual figures as percentages above or below trend as in Fig. 3.

It can be seen still better in Fig. 4 where each two successive overlapping 6-year cycles are averaged. The result is called a "two—6-year-section moving

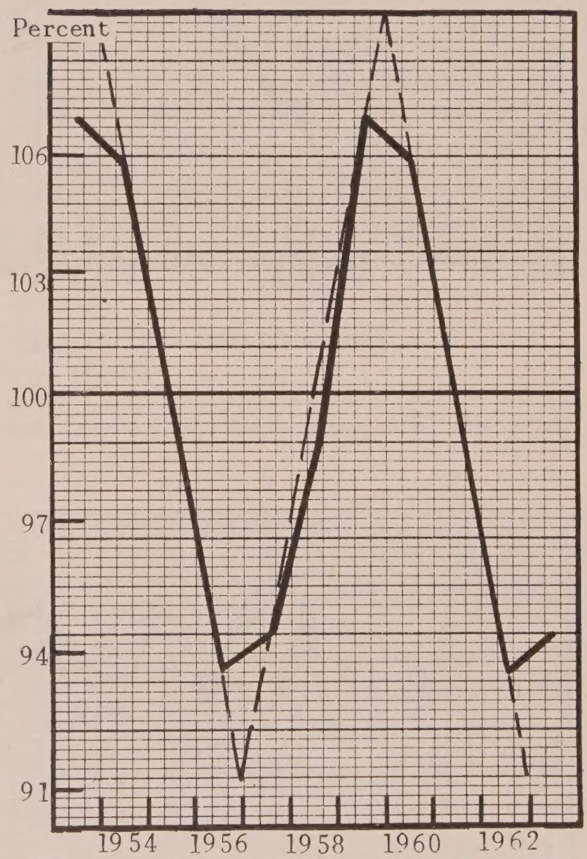


FIG. 1. THE TYPICAL 6-YEAR CYCLE IN STEEL PRODUCTION

The solid line, typical 6-year cycle 1867—1954. Broken line, idealized cycle. Ratio Scale.

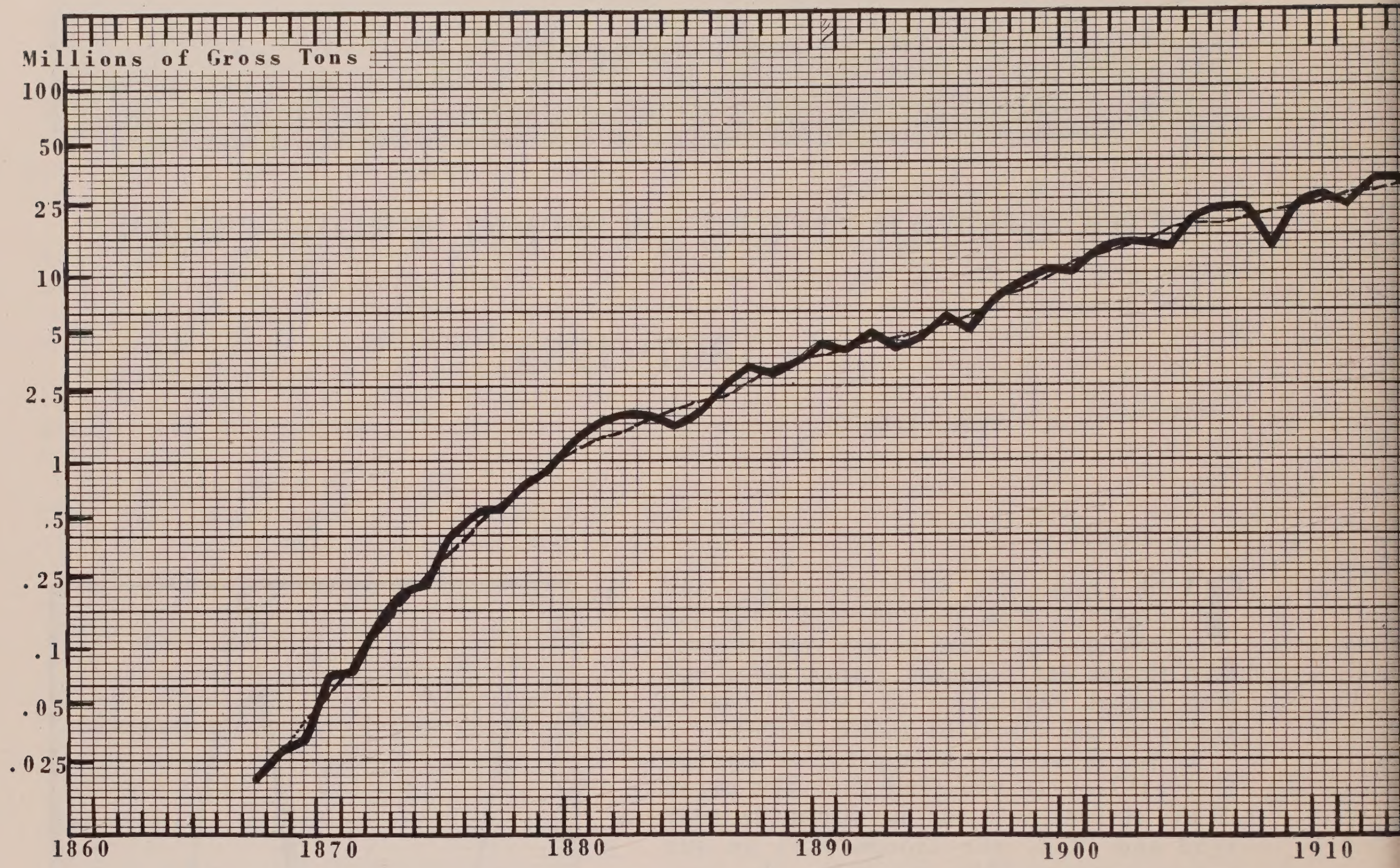


FIG. 2. PRODUCTION OF STEEL INGOTS AND STEEL CASTINGS IN TONS, 1867—1954.

Solid line, actual production; broken line, 6-year moving average trend; first three and last three trend values estimated. Ratio Scale.

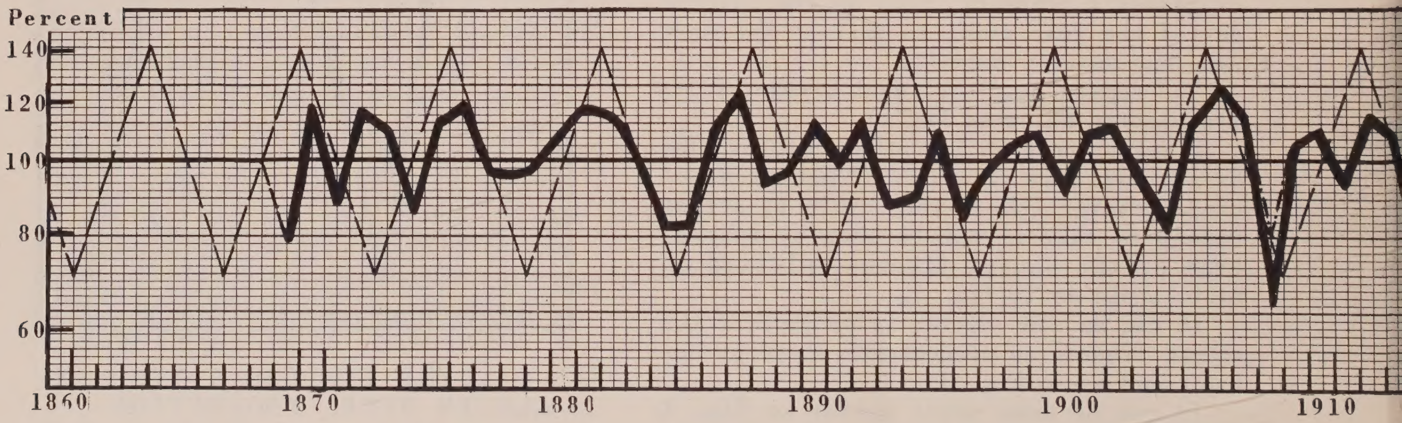
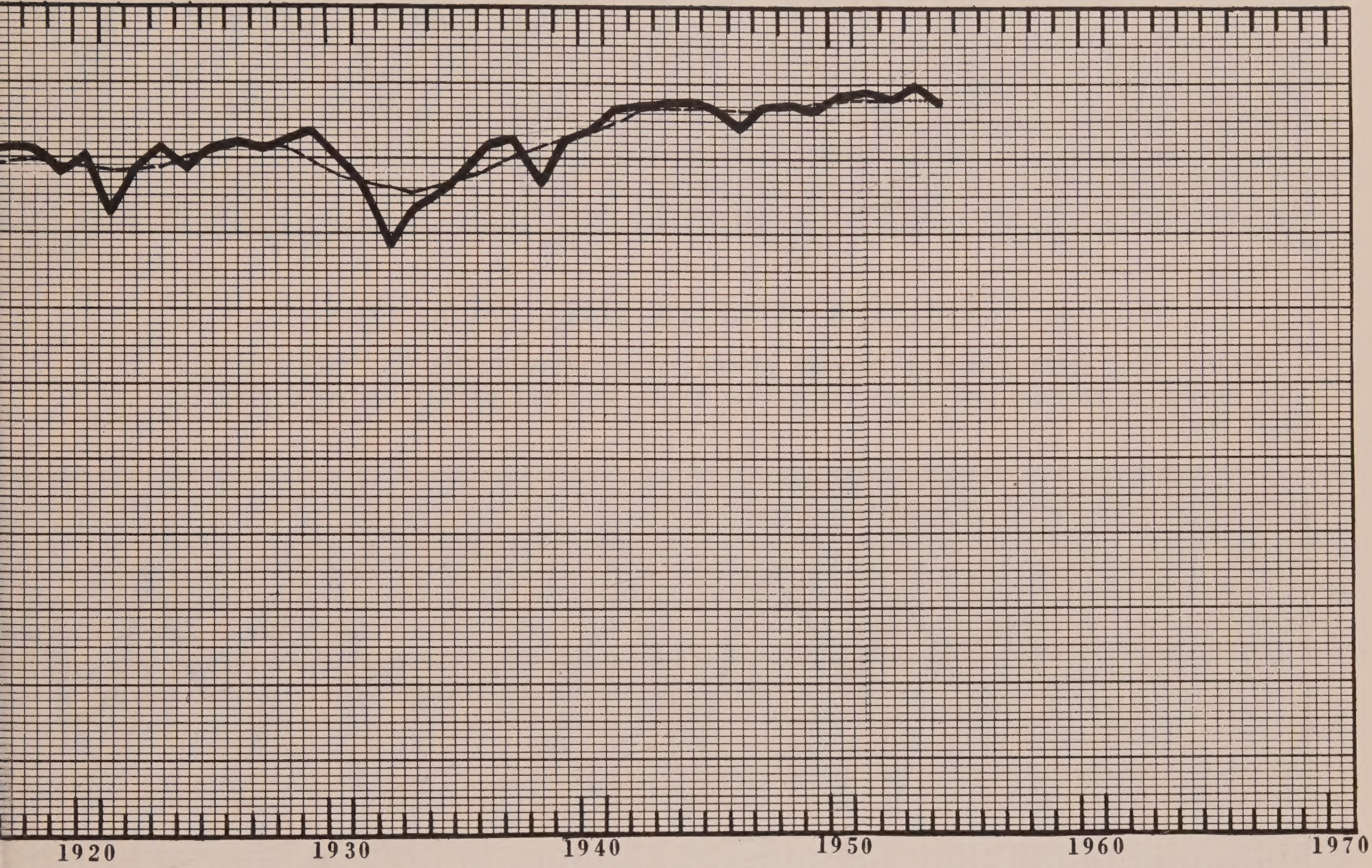


FIG. 3. THE 6-YEAR CYCLE IN STEEL PRODUCTION.

Percentages by which steel production has been above or below trend. Values limited to 126% and 79% are shown by means of a dashed line. The 6-year cycle is diagramed by means of a broken zigzag line. Ratio Scale.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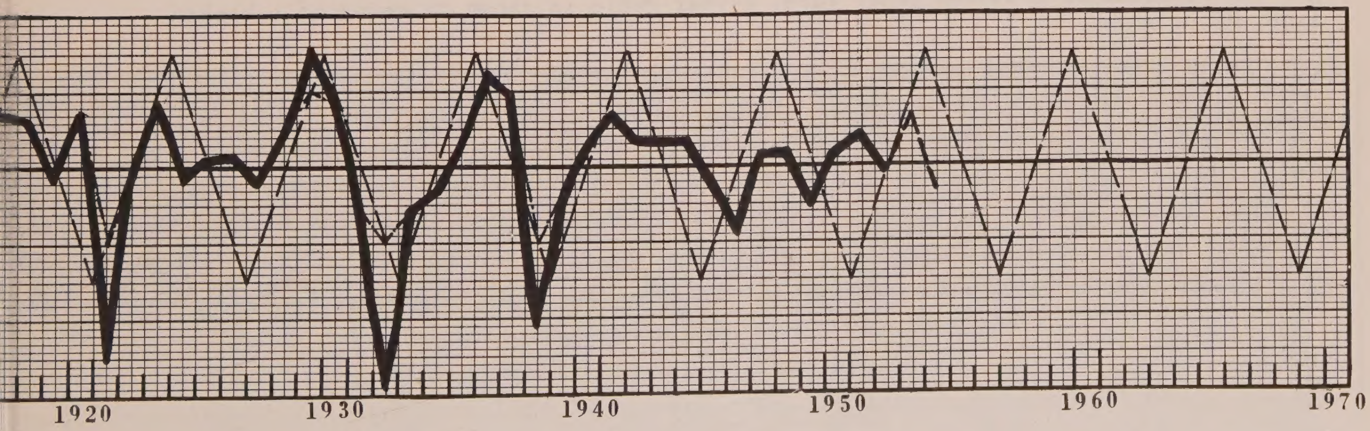
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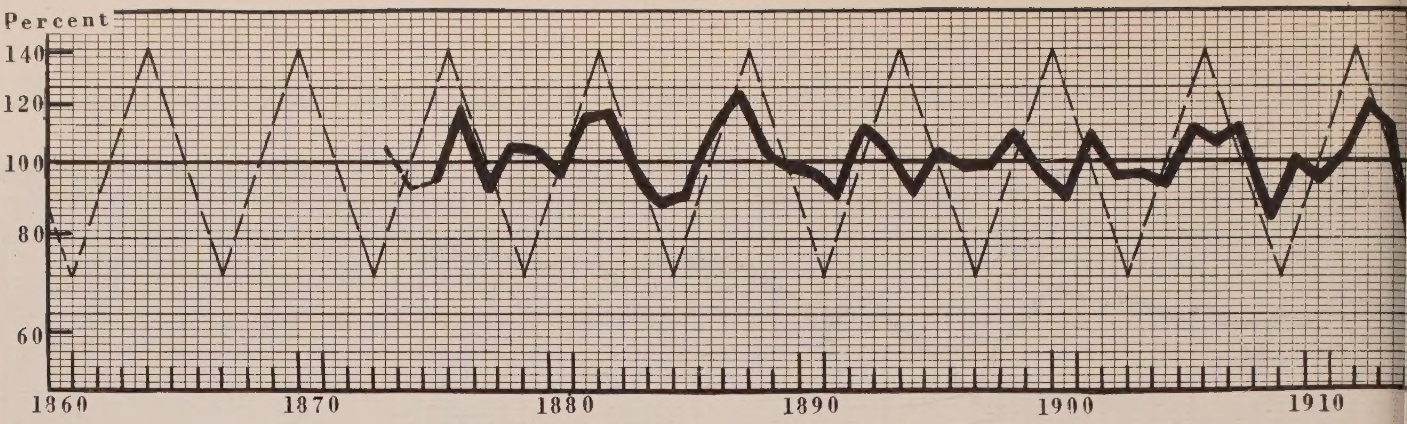


FIG. 4. THE 6-YEAR CYCLE IN STEEL PRODUCTION.

A two-6-year-section moving average of the values shown in Fig. 3. This manipulation minimizes randoms and shows the 6-year cycle in steel production more clearly. Ratio Scale.

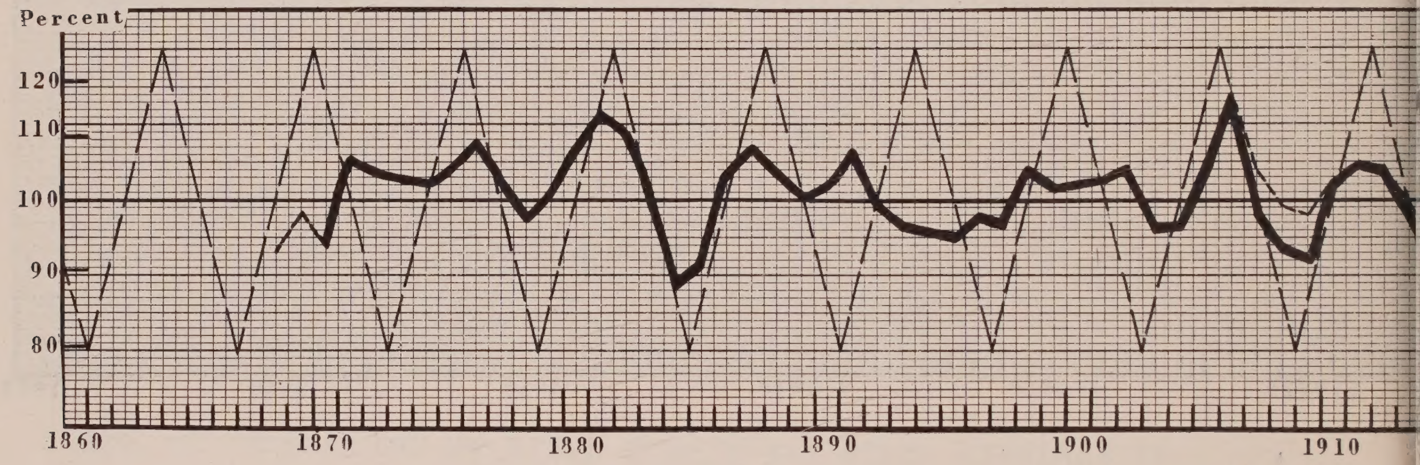


FIG. 5. THE 6-YEAR CYCLE IN STEEL PRODUCTION.

This curve illustrates another way of minimizing randoms. It shows the values of Fig. 3 smoothed by a 3-year moving average. Smoothed figures using limited data are plotted by means of a dashed line. Ideal 6-year cycle is shown by means of a broken line. Ratio Scale.

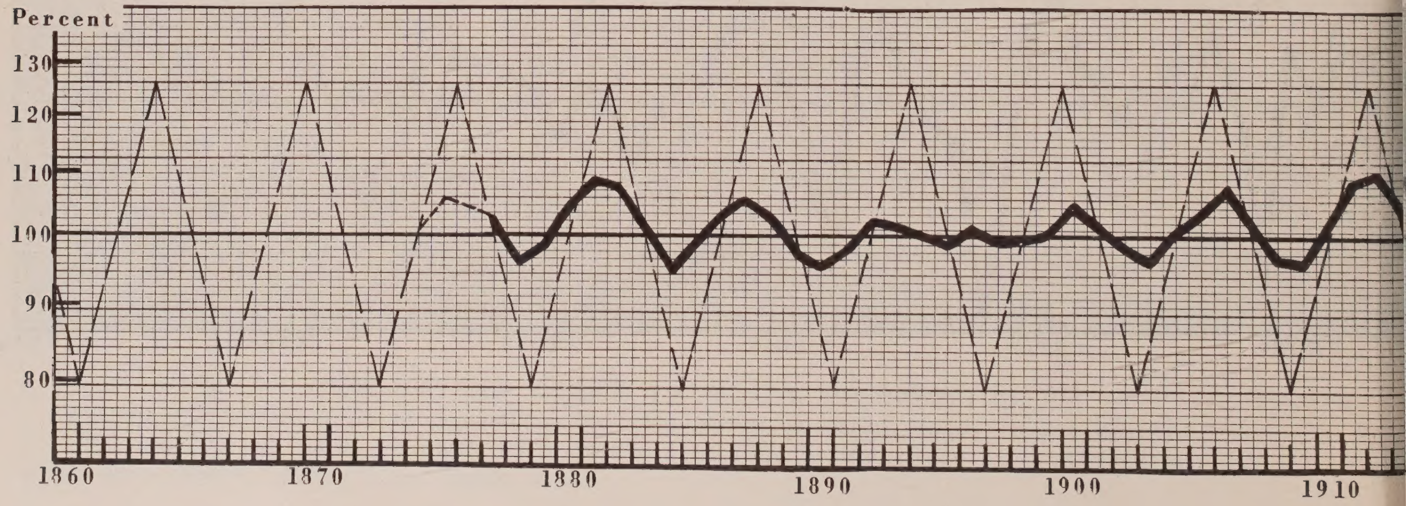
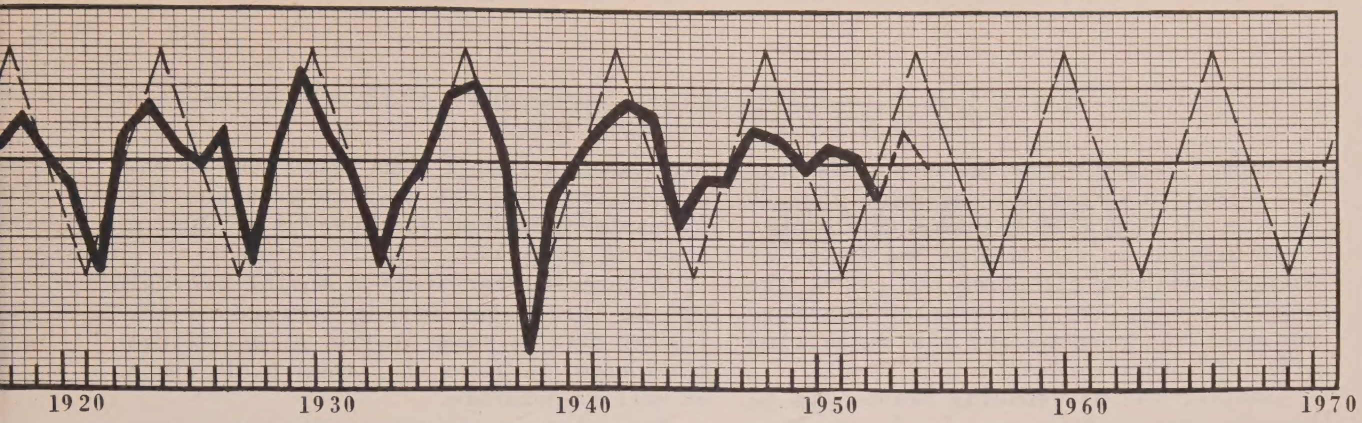


FIG. 6. THE 6-YEAR CYCLE IN STEEL PRODUCTION.

This curve shows a three-6-year-section moving average of the smoothed values using limited data (Fig. 5). It enables you to see the 6-year cycle more clearly because randoms have been reduced to the minimum. Ratio Scale.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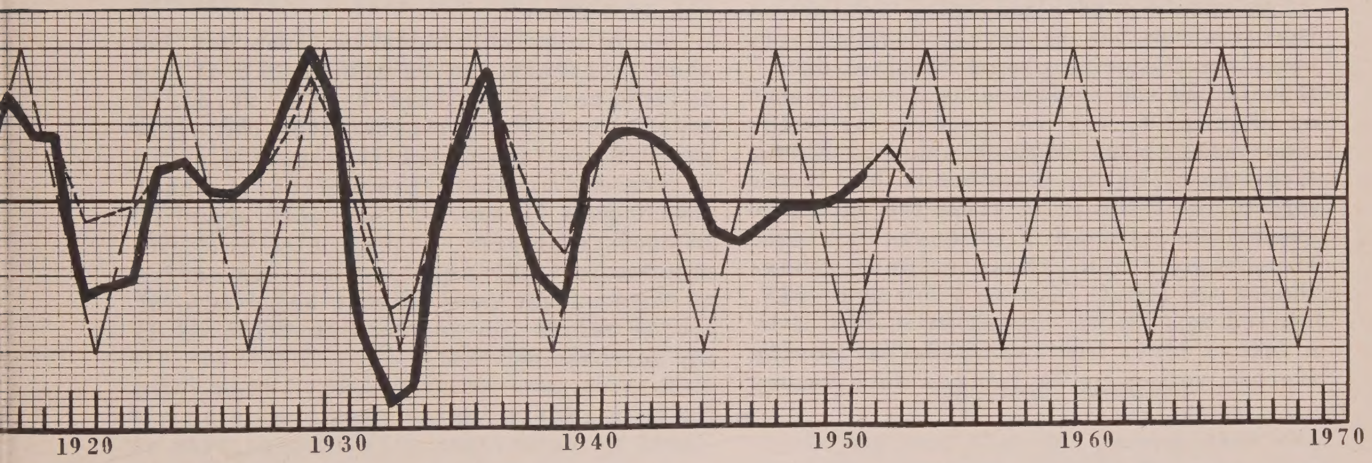
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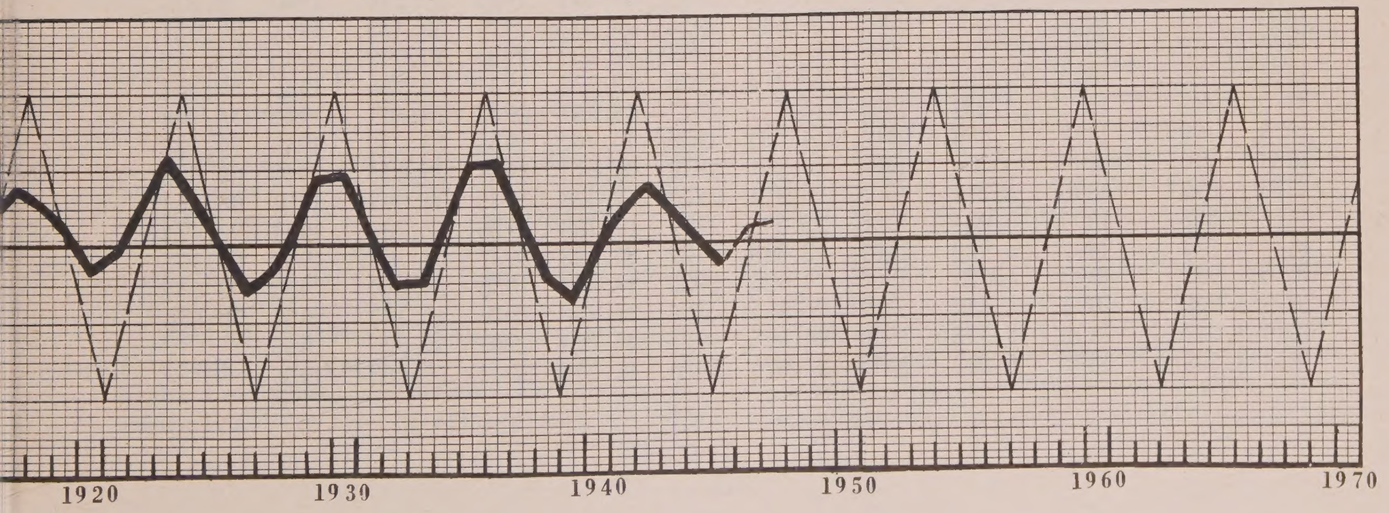
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average." This process has no effect upon any 6-year cycle present uniformly in each section but does reduce random distortion.

Of course you can average any number of sections without affecting the cycle, and the more sections you average the more you minimize randoms and the distorting effect of other cycles.

Another way of reducing randoms is to smooth them out by means of a moving average. This way has been utilized for Fig. 5, which shows a 3-year moving average of the values in Fig. 3. The value for each year plotted in Fig. 5 represents an average of the three values centering at that year.

Another way of eliminating randoms so that you can see the cycle more clearly is to use the principle of "limited data." That is, as the cycle has an average value of about ± 9%, any values over or below these amounts are obviously due to random distortions. We can therefore do but little harm to the cycle if we limit the values we use in our averaging processes to some size in excess of these values. I have chosen to limit data to + 26% and -21%. Limited data values are shown in Fig. 3 by a dashed line. Similarly, 3-year moving average values using limited data values are shown in Fig. 5 also. These various manipulations are not necessary to see the 6-year cycle. They are however needed in order to study it.

A three-6-year-section moving average of the three year moving average of the limited data is shown in Fig. 6. All things considered, it shows the 6-year cycle about as well as possible.

Note that in all the curves the 6-year cycle tends to fade out in the period 1890—1905. It looks as if it might be starting to fade out again. If so, we can expect, based on the 1890—1905 precedent, about 3 rather poor 6-year cycles, after which the 6-year cycle can be expected to reassert itself.

A cycle which gradually fades out and then reappears can be the result of the influences of another cycle, slightly longer or slightly shorter than the cycle which fades. I suspect that such a cycle is present in steel production. I shall investigate it and tell you more about it in another article. I shall also tell you about other cycles present in this series of figures. You need to know about several cycles before you are in a position to do any forecasting.

E.R.D.

Table 1
Production of Steel Ingots and Castings
1867—1954
In Thousands of Gross Tons

1867	19.6	1882	1,737	1897	7,157	1912	31,251	1927	44,935	1942	76,814
1868	26.8	1883	1,674	1898	8,933	1913	31,301	1928	51,544	1943	79,318
1869	31.3	1884	1,551	1899	10,640	1914	23,513	1929	56,433	1944	80,037
1870	68.8	1885	1,712	1900	10,188	1915	32,151	1930	40,699	1945	71,162
1871	73.2	1886	2,563	1901	13,474	1916	42,774	1931	25,946	1946	59,467
1872	143	1887	3,339	1902	14,947	1917	45,061	1932	13,681	1947	75,798
1873	199	1888	2,899	1903	14,535	1918	44,462	1933	23,232	1948	79,143
1874	216	1889	3,386	1904	13,860	1919	34,671	1934	26,055	1949	69,623
1875	390	1890	4,277	1905	20,024	1920	42,133	1935	34,093	1950	86,461
1876	533	1891	3,904	1906	23,398	1921	19,784	1936	47,768	1951	93,871
1877	570	1892	4,928	1907	23,363	1922	35,603	1937	50,569	1952	83,175
1878	732	1893	4,020	1908	14,023	1923	44,944	1938	28,350	1953	99,652
1879	935	1894	4,412	1909	23,955	1924	37,932	1939	47,142	1954	78,850
1880	1,247	1895	6,115	1910	26,095	1925	45,394	1940	59,806	1955	
1881	1,588	1896	5,282	1911	23,676	1926	48,294	1941	73,964	1956	

GLOBAL PATTERNS OF CYCLES IN TEMPERATURE

SUMMARY

This article brings up to date an account that I gave you last year on the research of Dr. Leonard W. Wing.

Using all the 260-odd temperature records in *World Weather Records* covering more than forty years, he finds that the additional stations corroborate the results he obtained from the 97 stations studied last year. The cycle highs (and lows) for each cycle studied (3.767, 4.222, and 4.418 years) appear first in the polar regions and pass over the face of the globe, simultaneously in the Northern and Southern Hemispheres. The departures from normal passage time show what may be a land-mass effect rather similar to what is generally considered as land-mass effects upon terrestrial magnetism.

READERS of these pages may remember an article appearing in *Cycles* for May 1954 (pages 165-175) telling you of some astonishing cycle discoveries by Dr. Leonard W. Wing, Research Associate of the Foundation for the Study of Cycles. As I told you in that article, Doctor Wing had observed four things:

Latitudinal Passage Discovered

First, he found that the calendar timing (dates) of the highs (and lows) of a certain weather cycle (a temperature cycle 4.222 years in length) come progressively later as you find them from either polar region to the equator.

Second, he found that, for any given latitude, the calendar timing (dates) of highs (and lows) of this cycle tend to be identical in the Northern and in the Southern Hemispheres.

Third, he found that the length of time required to slip from pole to equator is about 0.71 times the length of the cycle.

Fourth, he found, as far as he had been able to progress in the work, that cycles of other lengths seem to behave the same way.

These initial discoveries of which I told you and which he himself described more in detail in the *Journal of Cycle Research* (Summer, 1954) were based upon a study of this one cycle as it appeared in the records of some 97 different weather stations scattered over the globe from Alaska to Australia.

Additional Research

In the year that has passed since that article appeared, Doctor Wing has continued his research with the following further results:

1. Doctor Wing finds that when he studies the behavior of the 4.222-year cycle in nearly 150 additional weather stations he obtains confirmation of his original observations.
2. Doctor Wing finds that when the 3.767-year cycle is studied similarly in the records of the same weather stations, it too behaves in the same way.
3. Doctor Wing discovers that when he studies the 4.418-year cycle in the records of these same weather stations, this cycle behaves the same way.
4. Doctor Wing finds—and this is most important—that the irregularities of timing from his ideal timing of latitudinal passage have themselves a global pattern. Their irregularities show characteristics similar to the irregularities

of terrestrial magnetism.

This fact provides another hint that we are here dealing with electro-magnetic phenomena of the most fundamental kind.

The four discoveries enumerated above will be expanded in the four sections immediately following.

I. Latitudinal Passage of the 4.222-Year Cycle in Temperature in Each of 260-Odd Weather Stations

I see no particular purpose in a brief summary of this sort to name the additional weather stations used by Doctor Wing in studying the latitudinal passage of the 4.222-year cycle. It is enough to say here that they include every weather station in the world for which data longer than forty years are available in *World Weather Records* as published by the Smithsonian Institution of Washington. Data used run from the earliest available times through 1940.

Annual average weather data for each of these stations were punched on some 20,000 IBM cards. These cards were then thrown into 4.222-year periodic tables. These tables revealed the typical time of crest of this cycle for each of the stations involved.

Doctor Wing then plotted these times on a chart similar to that which I printed for you last year except that the new chart has more points spotted. Unfortunately, this chart is not yet ready for publication. However, except that it has more points it looks substantially like the chart published a year ago. For the benefit of new members or those who missed the article, I am reprinting the original chart as Fig. 1 herewith.

In addition, Doctor Wing plotted dates of the latest typical high of the 4.222-year cycle on a map of the world (see upper map of Fig. 2). He then connected, with lines the stations with highs of the same date in much the same way as the weather man connects on a weather map the places having the same temperature, the same rainfall, the same frost date, etc.

This map is another way of conveying the information diagrammed in Fig. 1. It shows that the 1949 line of crest is up near the pole, the 1950, 1951, 1952, and 1953 lines of crest are progressively nearer and nearer the equator.

II. Latitudinal Passage of the 3.767-Year Cycle in Temperature at Each of 250-Odd Weather Stations

When the punch cards referred to above were put into 3.767-year periodic tables for each of the indicated weather stations throughout the world, the times of crest of this cycle likewise tended to come later and later as the cycle manifested itself from pole to equator. This fact is illustrated in the lower map of Fig. 2.

The behavior of the 3.767-year cycle tends to corroborate Doctor Wing's hypothesis that all cycles behave in this way.

III. Latitudinal Passage of the 4.418-Year Cycle in Temperature in Each of 260-Odd Weather Stations

When the punched cards referred to above were thrown into periodic tables 4.418 years long, Doctor Wing obtained the same results as for the 3.767-year cycle. This tends even further to corroborate his hypothesis.

(The map showing the crests of the 4.418-year cycle is not yet ready for publication, but as far as it has been drawn it tends to show the same pattern.)

IV. The Pattern Developed By The Irregularities of Latitudinal Passage

As you can see by reference to Fig. 1, the points showing the time at which the cycle reaches its crest do not fall precisely on the line of latitudinal passage as if they were a file of soldiers on a parade ground. They tend to bunch about this line, but with variation one way or the other.

These variations are, of course, partially due to random distortions and local characteristics of the particular stations. Some of them may be due to the presence of other cycles. However, as you can see by the equatorward bending of the lines, on the maps of Fig. 2, there is a rather definite tendency for early turning stations to come in three broad bands across the world. These bands more or less conform to the three long major land masses. One band, starting in the polar region, whips down across the North and South American continents. Another band also starting in the polar region whips down across Europe and eastern Africa. A third band also starting in the polar region whips downward through Asia and Oceania (the South Sea Islands, Australia, etc.).

Systematic Behavior

This systematic behavior is in itself quite astonishing, but it is even more significant when you realize that magnetic variation behaves in much the same way, as you can see, by reference to Fig. 3. This map, taken from government sources, shows the lines of magnetic declination for the entire world.

As in most scientific work of a basic nature the results are suggestive of fundamental behavior. They open up new problems to follow and suggest new approaches for old problems. They suggest more than ever that, in studying cycles, we are dealing with some basic manifestations of the universe about us, and of which we are a part.

E.R.D.

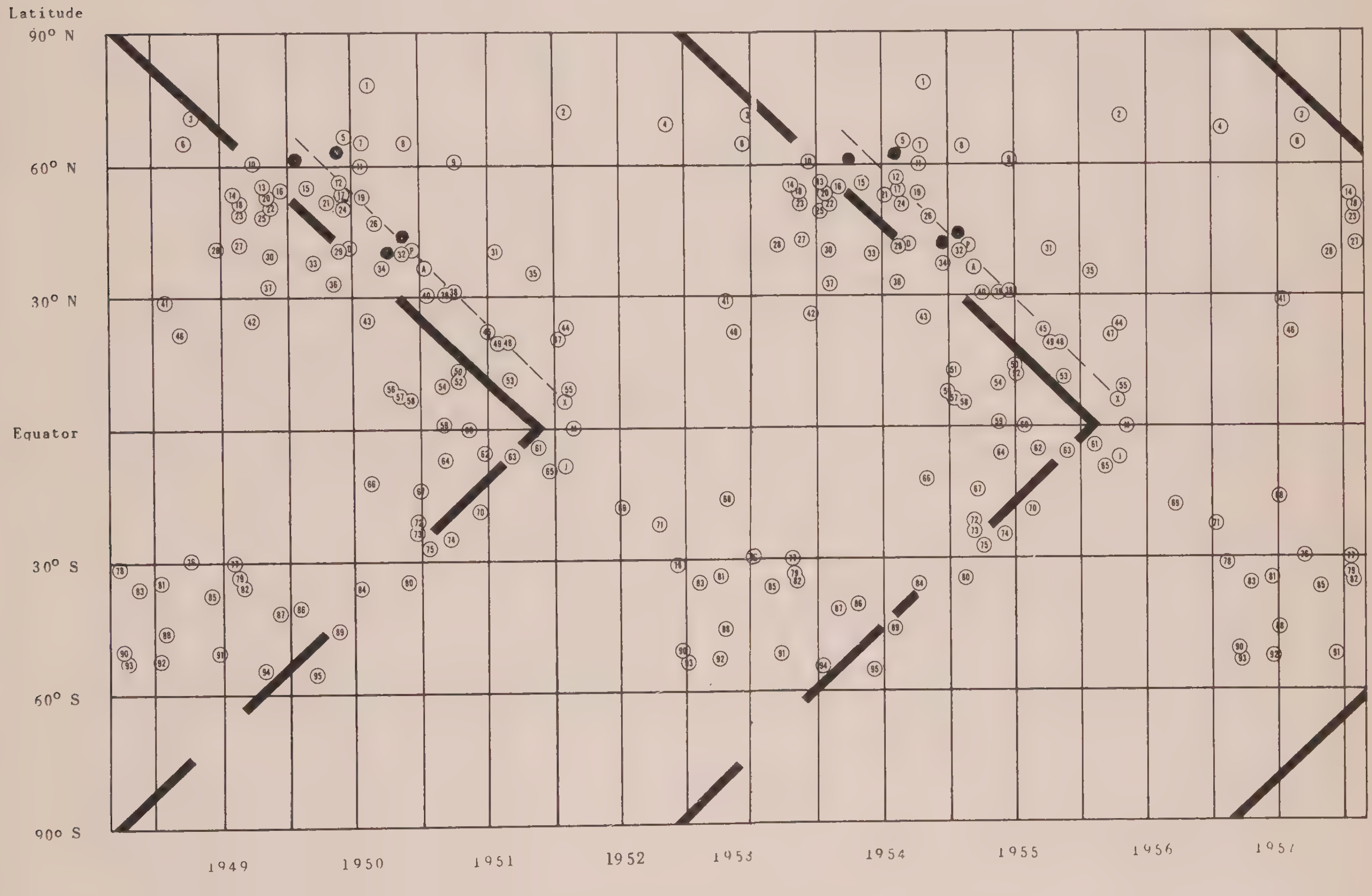


FIG. 1.
THE 4.222-YEAR CYCLE IN TEMPERATURE AND IN OTHER PHENOMENA PLOTTED BY LATITUDE

The horizontal scale represents years. The vertical scale represents latitude. The numbered circles mark lows of the typical 4.222-year cycle in temperature for 97 weather stations throughout the world. Lettered circles are turning points of other phenomena. (Open letter circles represent lows. Solid letter circles represent highs.)

Note that in both hemispheres the temperature lows come later and later as the phenomena are found nearer and nearer the equator. This behavior creates a mirror image or butterfly pattern as indicated by the heavy diagonal lines. Sunspots behave the same way. The dashed line indicates the typical tree ring turning points (circles labeled A, J, N, P, V, and Y).

It seems unlikely that a latitudinal shift as definite as this could come about by chance.

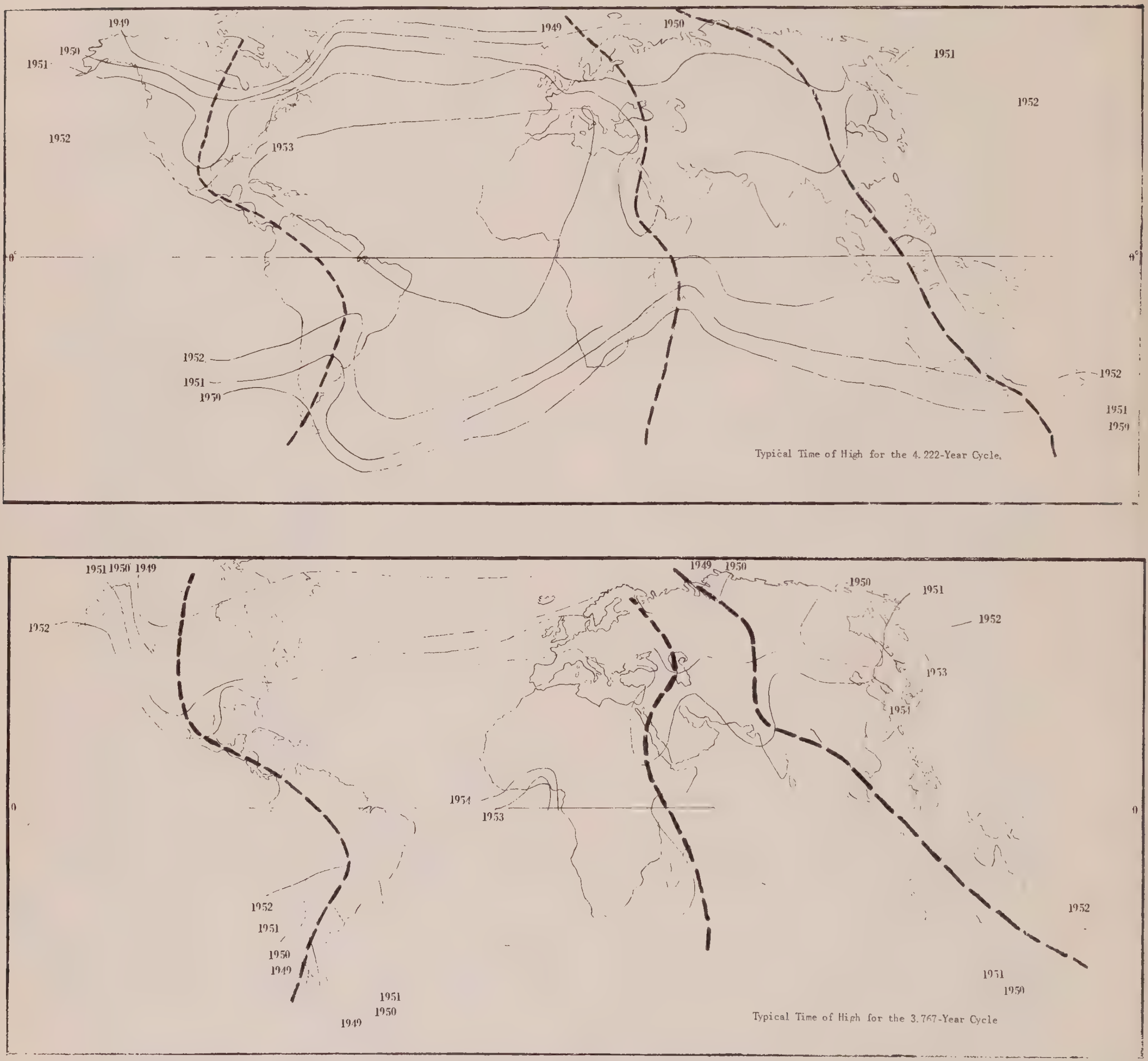


FIG. 2. WORLD MAPS SHOWING LATITUDINAL PASSAGE

Lines drawn on world maps to show times of temperature cycle highs. The typical time of high for the 4.222-year cycle appears in the upper map. The typical time of high for the 3.767-year cycle appears in the lower map. The lines show that cycle highs appear first in the polar regions and that they come later and later as we find them nearer and nearer to the equator. This behavior is called "latitudinal passage."

The lines bend toward the equator in zones as shown by the heavy broken lines. This means that in these zones, the crests of the cycle move equatorward ahead of the rest of the globe. It is an effect which may be related to land mass. Similar behavior can be noted in magnetic variation (See Fig. 3).

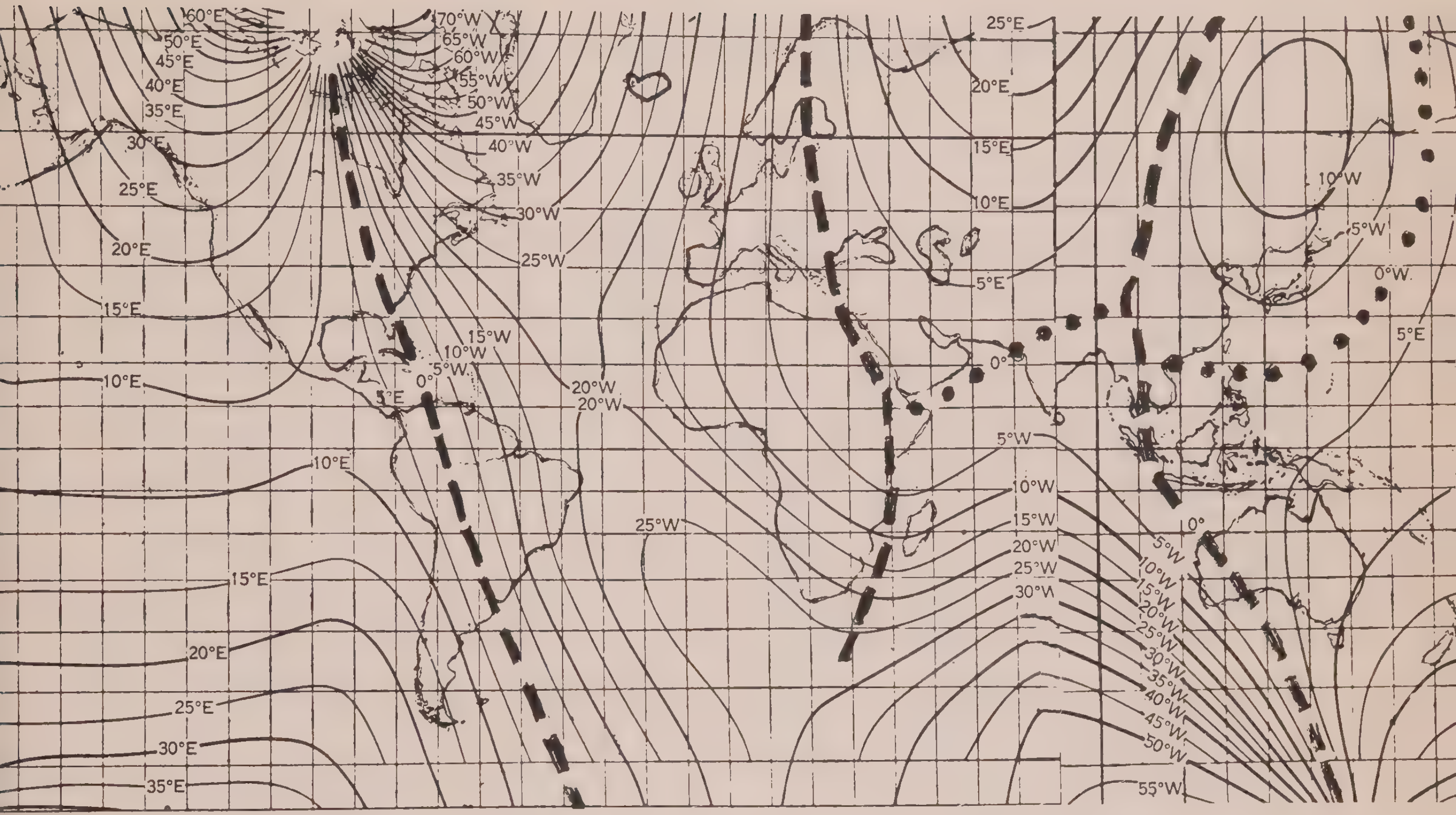


FIG. 3. WORLD MAP OF MAGNETIC DECLINATION.

The variation of the compass from true north (declination) shows an influence of land masses upon terrestrial magnetism. On this map, obtained from government sources, we have placed broken lines to indicate the zones of zero declination, except in Africa where it marks a zone of minimum relative variation. The similarity of position between these lines and the broken lines of Fig. 2 is provocative.

THE 16- OR 16 2/3-YEAR CYCLE IN COFFEE PRICES, 1854-1954

THE following excerpt has been taken from *The Tempest in the Coffee Pot*, a report by Professor F. A. Pearson of Cornell University. The chart on the next page is reproduced from the same publication.

"There are cycles in the production and prices of coffee just as there are cattle, hog, pepper and strawberry cycles. Cycles in coffee prices arise from the fact that it is alternately over- and under-produced. Coffee is not like an annual crop. Several years are required to bring trees into bearing, and, even though the crop is large and prices are low, the planters are loathe to abandon or destroy them. Seedlings do not produce beans until they reach commercial production about three years later. The mature trees produce beans for about fifteen to twenty years depending upon their care. Yields then decline and trees become unprofitable at, say, thirty to forty years of age.

Two Kinds of Coffee Plants

"There are, therefore, two kinds of coffee plants, bearing and non-bearing. It is today's number of bearing trees and their care that affects today's supply of coffee. On the other hand, it is the number of seedlings planted today that affects tomorrow's supply. (The coffee seedlings are planted in a clump of two to four, called a "pes" by Brazilian planters. There is an unsettled controversy concerning the number of seedlings that should be planted in a pes.) The number of non-bearing trees is much more variable than the bearing trees.

Coffee Cycle 16 Years Long

"Coffee cycles, as measured by prices, average about sixteen years long. (Since the records on prices are much more accurate than records on production, they were used to measure the cycles.) During the past century there have been six periods of low prices with the last one centered around the late thirties and early forties (Figure 2, next page). There have also been five high-priced periods and the sixth is now in the making. Based on the low-priced periods the length of the cycles were 14, 13, 21, 15 and 22 years. Based on the high-priced periods, the length of the cycles were 14, 17, 18 and 16 years. The peak-to-peak average was one year less than the low-to-low average, 16 and 17 years respectively.

"On the basis of the average number of years elapsing between the peaks of the cycles, 16 years, and the peak of the last cycle, 1928, the sixth cycle should have crested about 1944. Since this is 1954 and a high area is in the making, serious doubts will be hurled at the veracity of the cyclical theory.

Cycle Distorted

"As coffee is not following the usual cyclical pattern, a diagnosis of past departures from normal may be in order. One method is to draw a regular cycle, say 16 years long, through the last century of coffee prices. For the first eighty years the length of the actual cyclical fluctuations in coffee cycles closely approximated the sixteen-year theoretical cycle (Figure 2, next page). During the last twenty years, however, the actual cycle, if there was one, certainly did not follow the theoretical one.

Analysis of Low-Priced Periods

"Since the industry appears to be moving from a low- to a high-priced period, it may be fruitful to examine the low-priced periods and the subsequent highs. The first low-priced period, 1852-57, was six years long. The subsequent high occurred during the War Between the States, 1862-65. The prices for the high period were 83 per cent

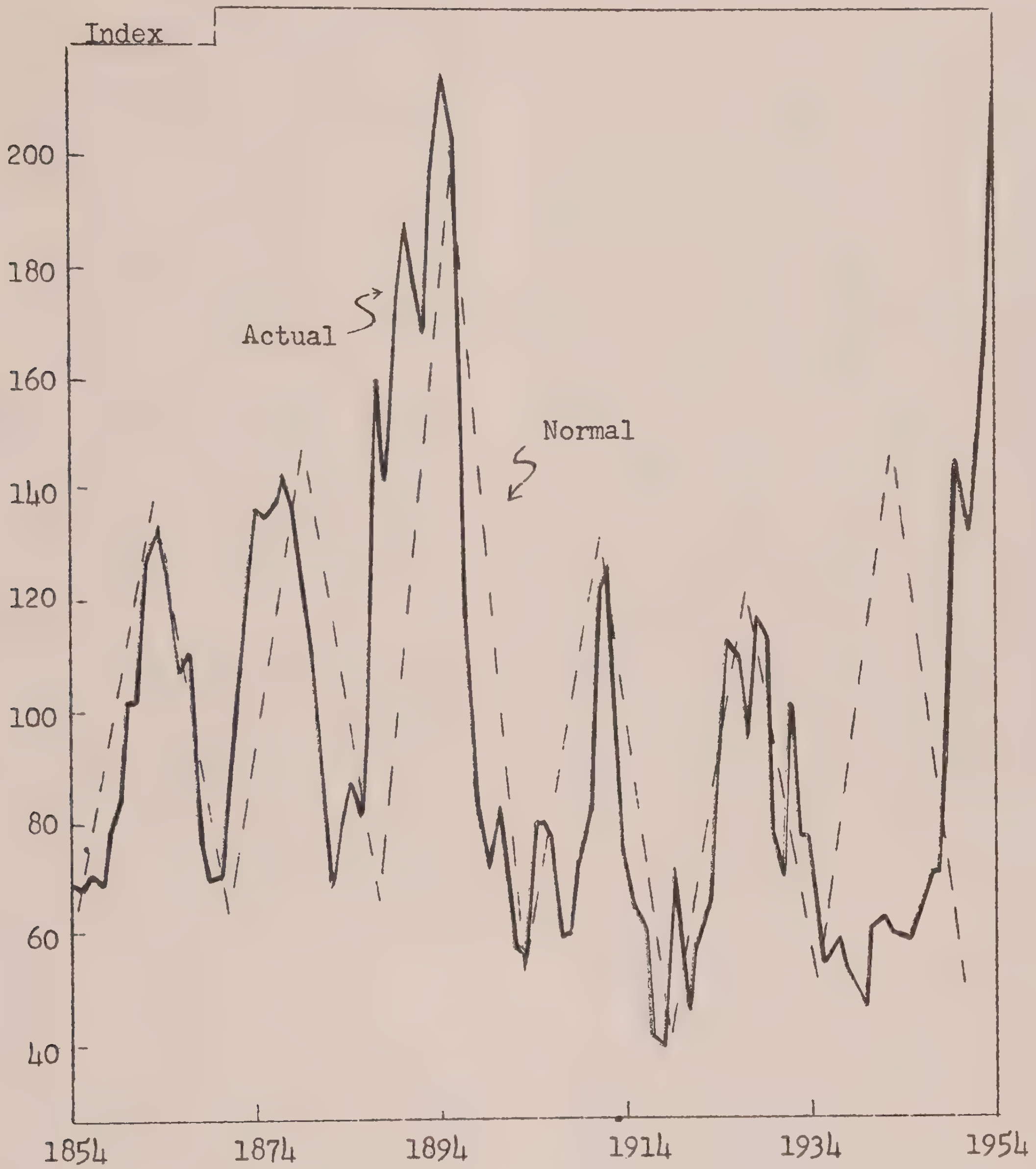


FIGURE 2. ACTUAL AND NORMAL COFFEE CYCLES AS MEASURED BY THE PURCHASING POWER OF NEW YORK WHOLESALE PRICES, 1854-1954

1910 - 14 = 100

The solid line shows the actual cycle of different lengths and amplitudes. The broken line is the normal cycle that is regular as to length but variable as to amplitude. For the first eighty years the actual cycle followed the 16-year normal cycle. During the past 15-20 years there has been a striking departure. Coffee prices have not followed the normal pattern. The peaks occurred in 1863, 1877, 1894, 1912 and 1928. The low points in 1855, 1869, 1882, 1903, 1918 and 1940. From *The Tempest in the Coffee Pot.*

above the previous low.

"The four subsequent low periods ranged from four to thirteen years in length and the high-priced ones from two to ten. The advances in real prices ranged from 79 to 127 per cent. The average length of the five low- and the high-priced periods was about the same, seven and six years. Prices "on the average" almost doubled, increasing 92 per cent. Apparently it takes about seven years of large crops and low prices before discouraged planters will curb the setting of seedlings, the start toward bringing consumption and production into better adjustment. Similarly, it takes about six years of short crops and high prices to encourage planters to expand production to meet the increasing needs.

"With these facts in mind the low prices of the thirties and forties that preceded the present advance deserve a careful scrutiny. The most striking fact concerning this period is that it was nineteen years long, more than twice the seven-year average and unequalled in statistical history. Another notable fact was the low prices of coffee. The average real price of coffee for these nineteen years was lower than for four of the other five low-priced periods.

World War II Distortions

"If the low-priced period which began in 1930 had been normal, it would have ended in 1937 or 1938. With the outbreak of World War II coffee ceased to move into the important coffee-drinking market of Western Europe. The result was too much coffee for too few consumers. In addition, the importing nations placed low ceiling prices on coffee to protect the dear people from the demon, inflation. The combined effect of these two price-depressing forces was to retard even the most enthusiastic from planting seedlings, to encourage the most pessimistic planters to destroy their oldest trees and to cause the Brazilian government to continue destroying coffee. During the low-price period prior to Pearl Harbor Brazil destroyed the equivalent of about three years of world consumption. (The destruction continued during the war but complete records are not available.) This unparalleled over-all liquidation extended over a period of about fifteen years and accounts, in part, for the fact that the actual cycle hasn't followed the normal pattern since the early thirties.

"The low prices that depressed production had a stimulating effect on consumption. During 1937 the United States imports were equivalent to one-third of the total world production and by 1946 the imports had increased to three-fourths.

World War I Comparisons

"A somewhat similar situation existed during World War I. The period of low prices lasted ten years which was longer than the average but shorter than the nineteen-year low during World War II. The situations were alike in that the blockades reduced exports to Central Europe. They were also alike in that there was a rapid expansion in European consumption following the cessation of hostilities and coffee prices turned upward. Because of the greater liquidation during World War II, the advance in prices following this war was more spectacular. From the Armistice of 1918 to the 1925 peak the wholesale prices of Rio No. 7 at New York City about trebled and from the demise of price fixing of 1946 to the 1954 peak wholesale prices of Santos No. 4 at New York City a little more than trebled. In another respect they were again much alike. The first advance extended over a period of seven years and the second was only one year longer.

Similarities and Differences

"The situations were different in that World War I broke out just as the cycle was about to move *into* a low-priced period, whereas World War II broke out just as the cycle should normally have moved *out* of a low-priced period. They were also unlike in that the price fixing of World War I was a mere bagatelle compared to that of the second war. They were unlike in that a part of the rapid post-World War II rise in European imports was due to the abundant supplies of dollars under the Marshall Plan, E.C.A., N.A.T.O., etc. at the expense of the American taxpayer and the American coffee drinker, United States prices rose with world-wide shortage of coffee, but due to the rapid rise in European coffee imports, they rose more than otherwise would have been the case. How much was due to foreign aid is any man's guess, but whatever it was, it rests on the doorstep of our international Crusade Against Communism and not on the doorstep of the coffee trade."

* * * *

Professor Pearson has shown clearly why the present cycle is distorted. No ordinary cyclic force could withstand the distorting pressures of which he speaks.

What's Ahead?

What is going to happen now?

There are, from the standpoint of the cycle student, three possibilities:

The first possibility is that the cycle, having been broken, will never return. In this event we can assume that the 16-year cycle from 1854 to 1934 was merely chance phenomenon.

The second possibility is that the cycle, having been forced out of step by a little over half a wave, will resume in 16-year waves but starting from 1954 instead of 1944. In this event we can assume that the cycle is "dynamic" or of internal origin. That is, we can assume that the cycle is caused by the time it takes planters to adjust to price, and price to adjust to supply, as explained by Professor Pearson.

The third possibility is that the 16-year cycle will resume and that, when the effects of the war and post war distorting forces have spent themselves, it will work its way back into step with the original cycle as manifest from 1854 to 1934.

If it behaves this way, the 1954 crest may, in retrospect, look like the 1960 crest come 6 years early or the 1944 crest come 10 years late. In this event we are at liberty to believe that the original cycle was probably due to *external* cyclic forces, probably acting upon the people who produce and/or buy the coffee.

In this connection I would like to raise the point that the 1854—1934 year cycle may not have been exactly 16 years long. It is true that, *measured end to end,* 16 years fits best, but if we take all turning points and all intermediate values into account it may happen that a slightly longer length will provide a better fit. In fact it could be that the cycle is as long as 16 2/3 years. At all events, crests come at about the right time for the 16 2/3-year cycle as discussed in our report for last month (May 1955). This however is a subject for future investigation. *E.R.D.*

THE 15 1/7-YEAR CYCLE IN BLACK PEPPER PRICES, 1819-1953

THE wholesale price of black pepper, has fluctuated in a rhythmic cycle which, on the average, is 15 1/7 years long over the entire span of 135 years for which figures are available.

In an earlier study, using figures back to 1860, the cycle seemed to be 14.8 years long. Now, using 43 additional years of figures, it is seen to be, on the average, slightly longer.

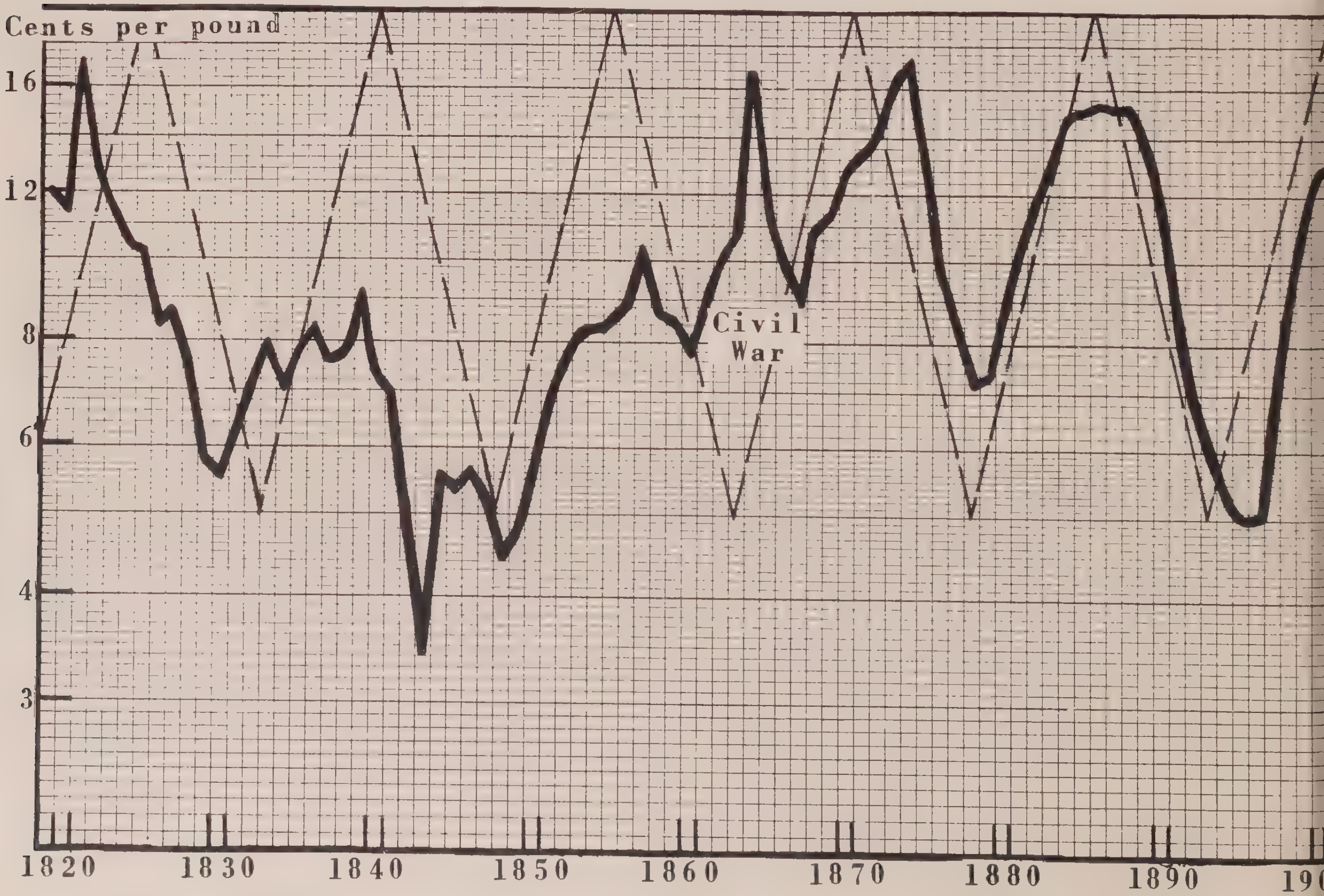
The *timing* of this cycle has been fairly regular, but the level of the prices has varied considerably, especially during the present wave.

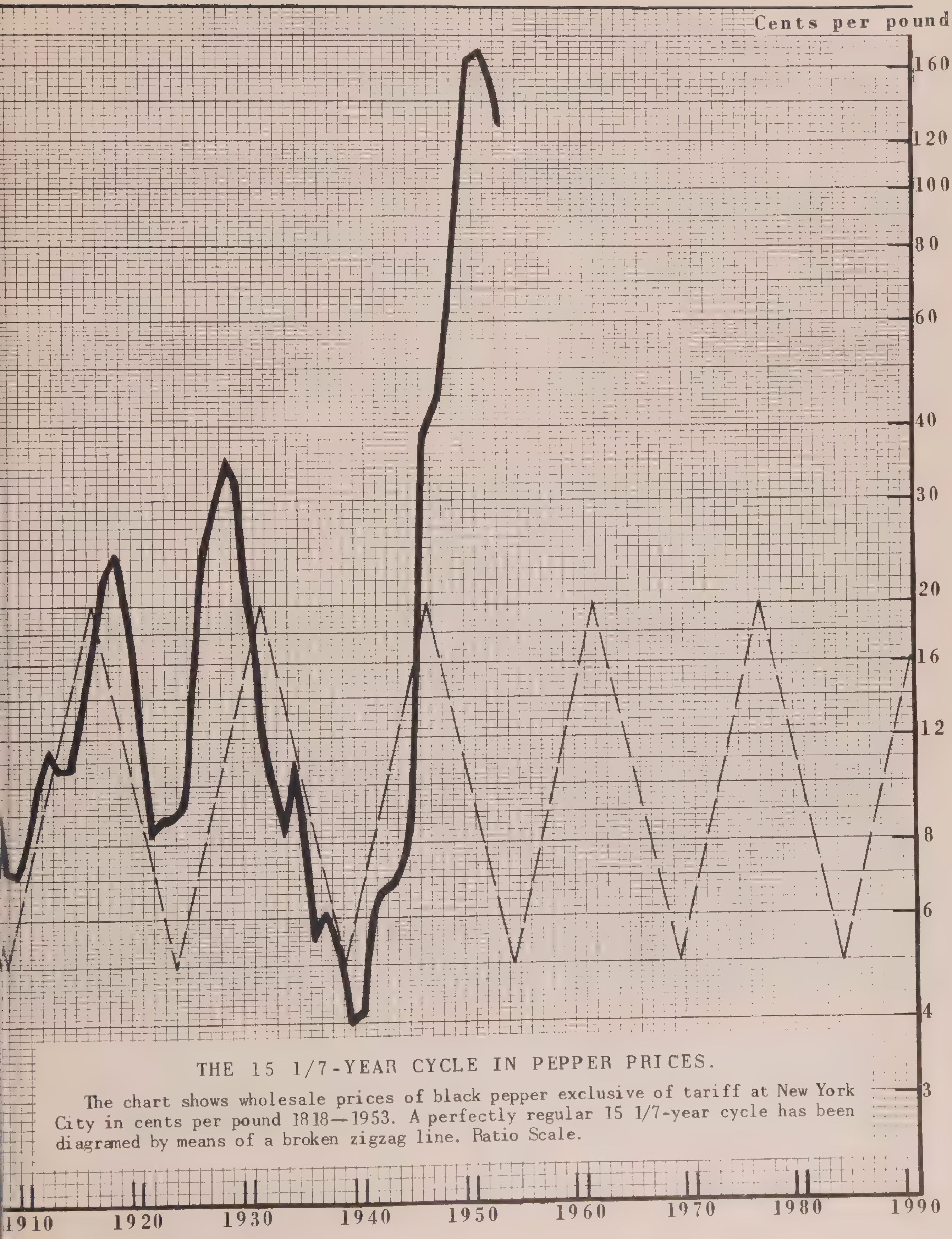
If we disregard the peak during the Civil War where there "should" have been a trough, 10 of the 16 major turning points came within two years one way or the other of perfect timing.

The peak of 1951 was the most distorted, both in levels and in timing, of any peak during the entire span of 135 years. I do not know the cause of this current distortion, but it is possible that it is akin to a similar distortion discussed by Doctor Pearson in his article on cycles in coffee prices. At all events, after so great a distortion, a further period of distortion must be expected.

My footnote to Doctor Pearson's article on coffee prices is equally applicable to the behavior of pepper prices. That footnote, to which you are referred, discussed what is ahead. It stated the implications, cyclewise, of various possibilities.

E.R.D.





THE 15 1/7-YEAR CYCLE IN PEPPER PRICES.

The chart shows wholesale prices of black pepper exclusive of tariff at New York City in cents per pound 1818—1953. A perfectly regular 15 1/7-year cycle has been diagramed by means of a broken zigzag line. Ratio Scale.

THE 4-YEAR CYCLE IN SUNSPOT NUMBERS, ALTERNATE CYCLES REVERSED, 1749—1954

IF you draw a chart of sunspot numbers with every other 11-year cycle upside down you get a rhythmic cycle about 22 1/5 years long.[1] (The idea of reversing alternate cycles was first suggested by C. N. Anderson.[2,3]) The physical justification for this procedure is that sunspots reverse their polarity in alternate cycles.

Suppose you now adjust the values of the curve just described for the average 22 1/5-year cycle, just as you would adjust for seasonal variation. Plot the result. You get a much smoother curve which, on its part, shows a cycle about 18 years long.

If then you express these adjusted values as percentages of their 5-year moving average trend you get the series of figures charted below. This curve shows you all the minor fluctuations of sunspot numbers.

These minor sunspot fluctuations evidence a 4-year cycle. The timing of this cycle has been diagrammed by the broken zigzag line.

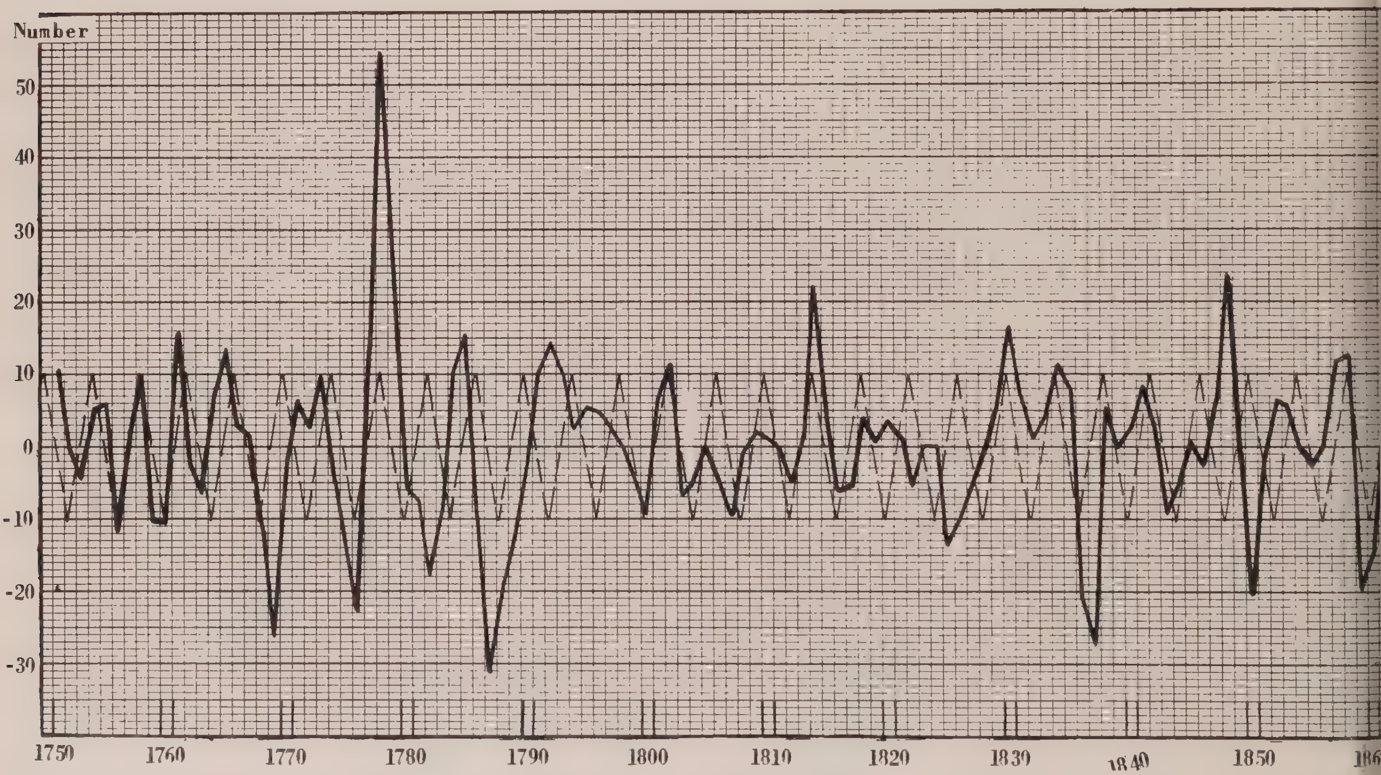


FIG. 1. THE 4-YEAR CYCLE IN SUNSPOTS WITH ALTERNATE CYCLES REVERSED, 1751—1952.
The broken line diagrams, for comparison, a perfectly regular 4-year cycle. There are many periods of major distortions but there is enough correspondence

The characteristics of the 4-year cycle in sunspot numbers with alternate cycles reversed are as follows:

Length (as nearly as I can determine it): 4.00 years.

Shape: symmetrical.

Amplitude: plus 2.1 spots at time of crest, minus 2.1 spots at time of trough.

Timing: Current crest, 1954.25.

I have been impressed by the extent to which the lengths of the various cycles in sunspot numbers seem to correspond to the lengths of cycles here on earth. (This, however, does not mean that I believe that sunspots are the cause of terrestrial cycles.)

The four-year cycle offers another example of this correspondence of wave length.

E.R.D.

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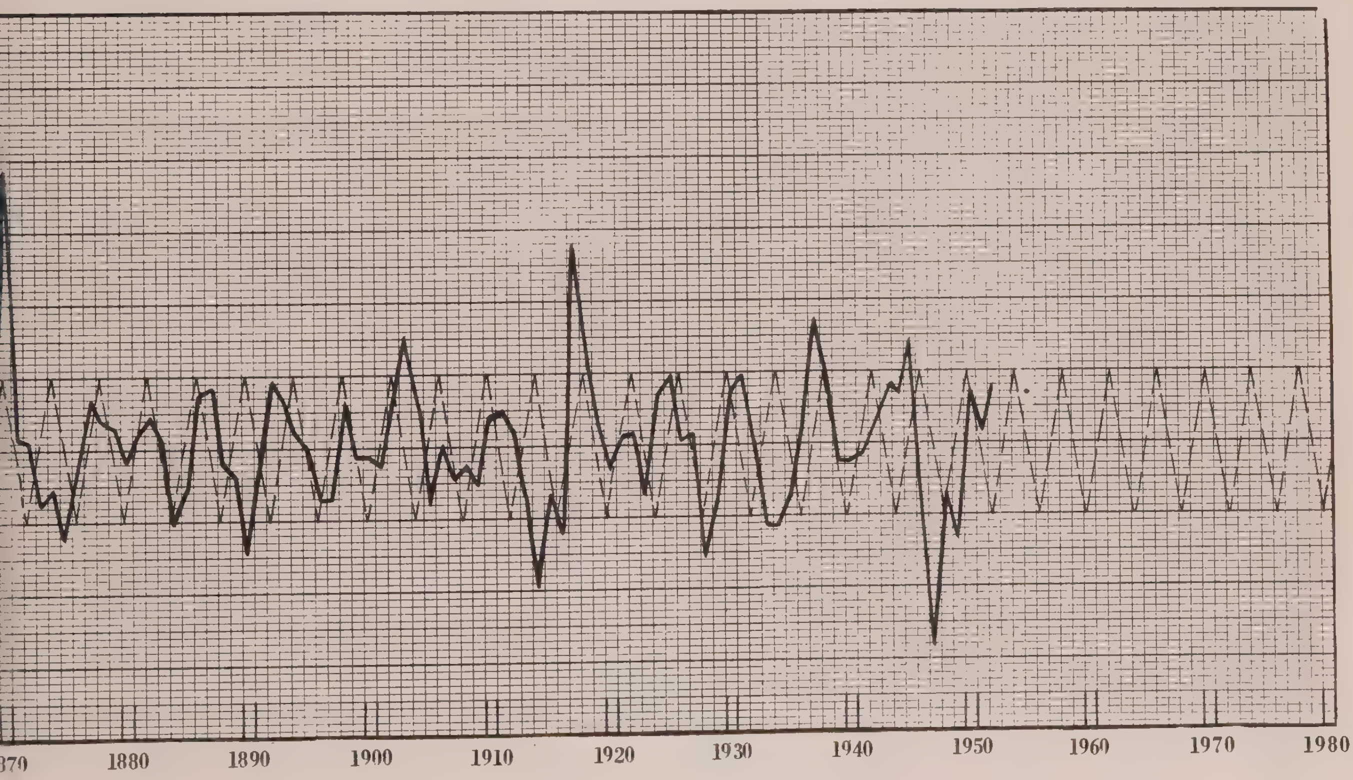
1. Dewey, E. R., "Cycles in Sunspots—the 22 1/5-Year Cycles in Relative Sunspot Numbers with Alternate Cycles Reversed, 1749--1949," *Cycles,* Vol. I, No. 1, June 1950, pp. 8-10.

2. Anderson, C. N., "A Representation of the Sunspot Cycle," *Bell System Technical Journal,* Vol. XVIII, April 1939, pp. 292-299.

3. Anderson, C. N., "Notes on the Sunspot Cycle," *Journal of Geophysical Research,* Vol. LIX, No. 4, December, 1954, pp. 455-61.

4. Dewey, E. R., "The 18-Year Cycle in Sunspots with Alternate Cycles Reversed," *Cycles,* Vol. I, No. 2, September 1950, pp. 8-19.



between the sunspot curve and the ideal perfectly regular 4-year cycle to suggest that the 4-year cycle, present on the average in the sunspot figures, may be more than an accident.

For an explanation of how the sunspot curve (solid line) was obtained see the text.

THE 4-YEAR CYCLE IN THE CONSUMPTION OF CHEESE, 1867—1953

FIGURES are available on the apparent civilian per capita consumption of cheese in the United States year by year from 1867 through 1953.[1] These figures are charted in Fig. 1 below.

Fig. 1 also shows, by means of a broken line, the 5-year moving average trend of cheese consumption. (The first two and the last two values of trend are estimated.)

Cheese consumption from 1867 to date has evidenced a 4-year cycle. This cycle can be seen in Fig. 1. It can be seen even better in Fig. 2 which charts the percentages that the actual estimated con-

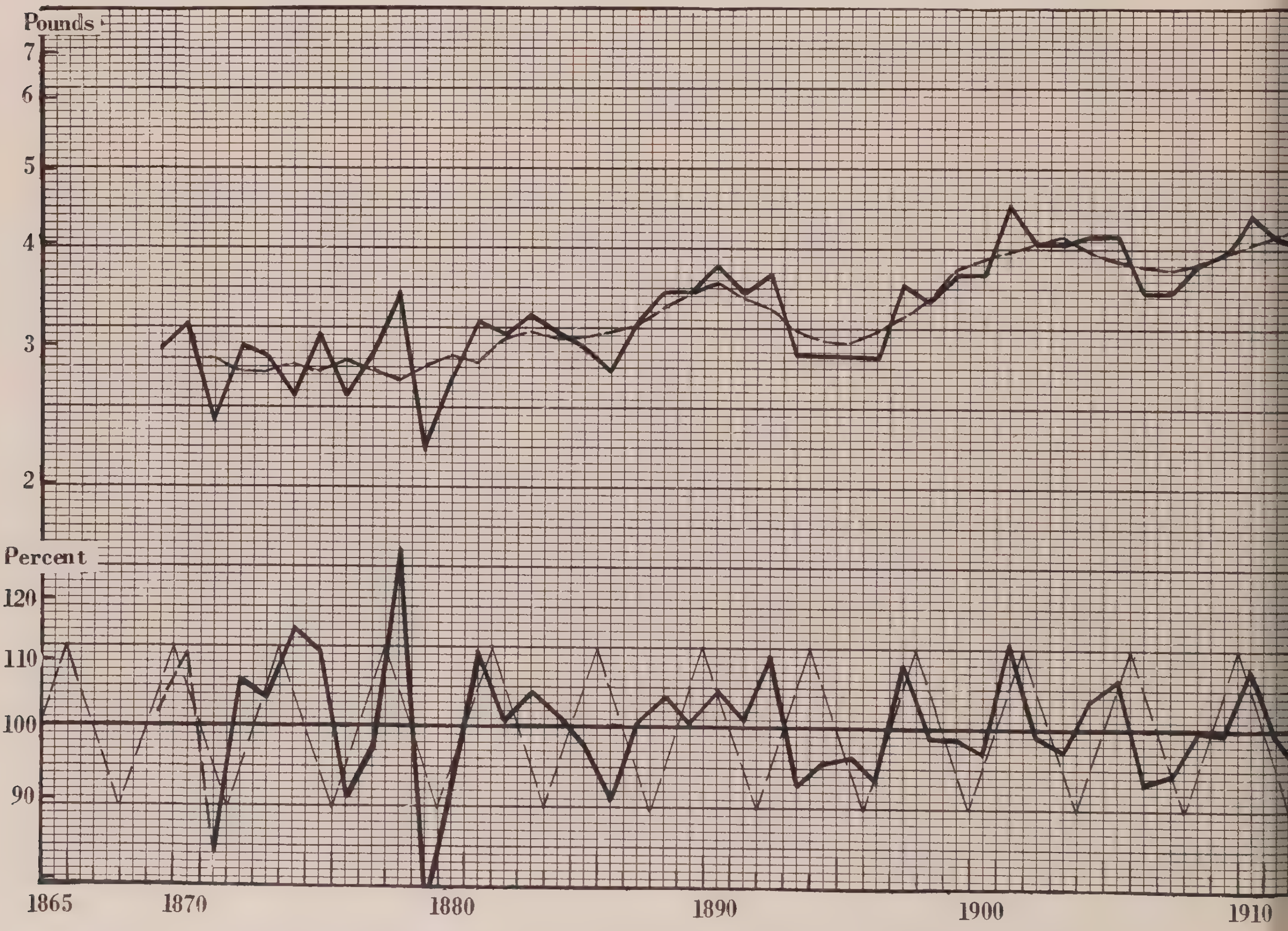


FIG. 1. THE 4-YEAR CYCLE IN THE APPARENT CONSUMPTION OF CHEESE, 1869—1953.

Upper curve: Solid line, the apparent consumption of cheese, 1869--1953.
Broken line, the 5-year moving average trend. (First two and last two values estimated.)

sumption figures are above or below trend. The 4-year cycle is diagrammed by a broken zigzag line.

The characteristics of the 4-year cycle in the apparent civilian consumption of cheese are as follows:

Crests come at 1870.0 and every four years thereafter. This puts the current crest 1954.0. Troughs come two years after crests.

As near as I can determine it the length is 4.0 years. The shape seems to be zigzag.

The strength of the cycle is 102.6% of trend at time of crest, 97.4% of trend at time of trough.

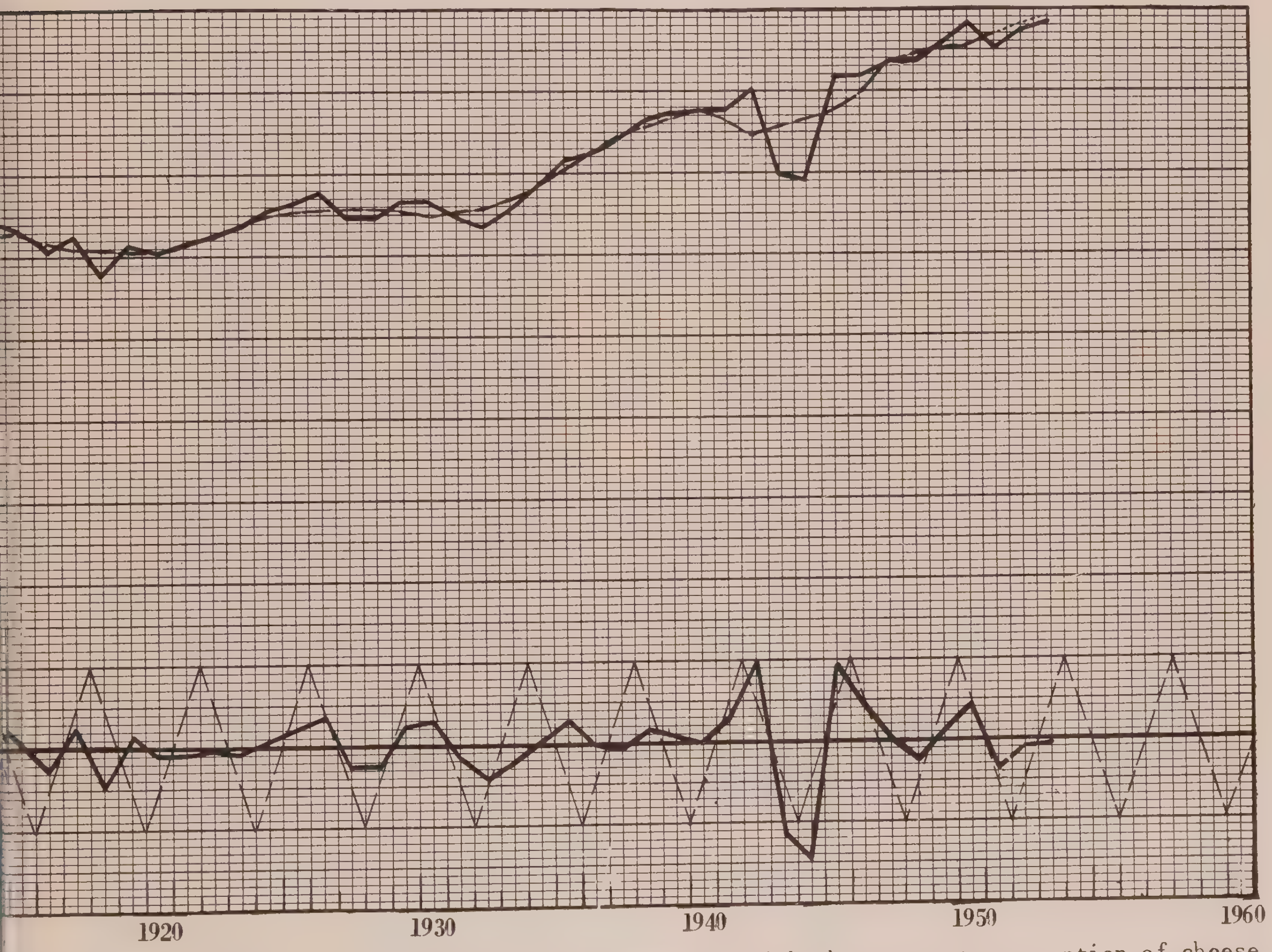
The series is long enough to permit 21 repetitions of the cycle. In a large number of instances, the cycle seems to have been strong enough to dominate.

E.R.D.

References

1. 1869—1945, *Historical Statistics of the United States*, 1789—1945, Washington, D. C. 1949, Series C—148.

1946—1953; *Statistical Abstract of the United States*, Washington D. C. 1954, Table 102.



Lower curve: Solid line, percentages by which the apparent consumption of cheese is above or below trend (as the first two and last two trend values are estimated the first two and last two percentage values are estimates also).

Lower curve: Broken line diagrams a perfectly regular 4-year cycle.

In spite of distortions, the tendency for the actual percentages to conform to the timing of the ideal 4-year pattern is probably more than coincidental. Ratio Scale.

How it Came Out

THE 6 YEAR CYCLE IN STANDARD OIL OF CALIFORNIA

GROSS operating income of the Standard Oil Company of California has evidenced a 6-year cycle from the incorporation of the company in 1926 up to the present time. This cycle was first discovered in 1949. It has continued since discovery. Ideally the cycle has a value of 12% above and below trend at time of crest and at time of trough respectively. The current crest of the 6-year cycle is due ideally midway between 1954 and 1955. This means that, ideally, the years of 1954 and 1955 should each be about 8% above trend; 1956 should be on trend; 1957 and 1958 should be about 8% below trend, subject of course to distortion caused by randoms and by other cycles.

The typical and the idealized cycles are shown in Fig. 1 below.

The record of experience of this company is so short that you would not be justified in attaching significance to this 6-year cyclic behavior if it were not for the fact that other companies, with longer records of experience, behave the same way over their entire span of existence.

Fig. 2 shows actual gross operating income 1926—1954 together with a 6-year moving average trend. Such a trend loses three values at each end of the series.

Fig. 3 shows the percentages by which the actual values have been above or below trend. As the trend values for 1926-7-8 can never be known and the trend values for 1952-3-4 are not yet knowable, this curve runs only from 1929 through 1951.

In both curves the values which have become available since this cycle was discovered are shown by a bold line.

The underlying growth trend of this company is so strong that the effect of the 6-year cycle is merely to damp or retard the rate of growth. No actual decline of gross operating income is to be expected as a result of the influence of the 6-year cycle.

E.R.D.

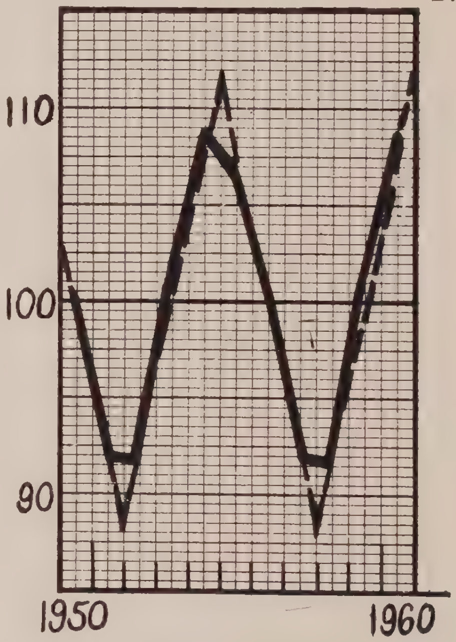


Fig. 1. The 6-Year Cycle in Standard Oil of California Gross Operating Income.

Solid line, typical 6-year cycle.

Broken line, idealized 6-year cycle.

The ideal cycles goes up (or down) to a point between years because, if we had monthly figures, they would (presumably) continue the direction of the curve as determined by the two previous years.

However, whether they do or not makes no difference in forecasting annual values for the 12% above or below trend falls between years and therefore is never used.

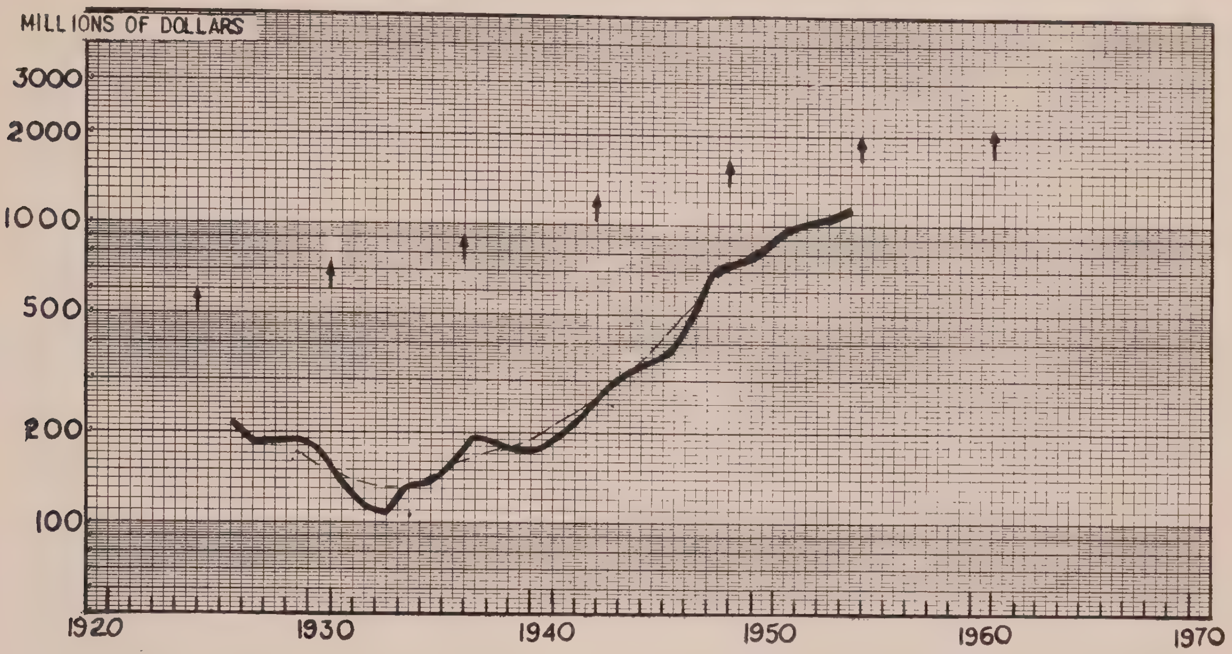


Fig. 1. Standard Oil Company of California Gross Operating Income, 1926—1954, together with a six-year moving average trend. Arrows indicate time of high of six-year cycle. Ratio Scale.

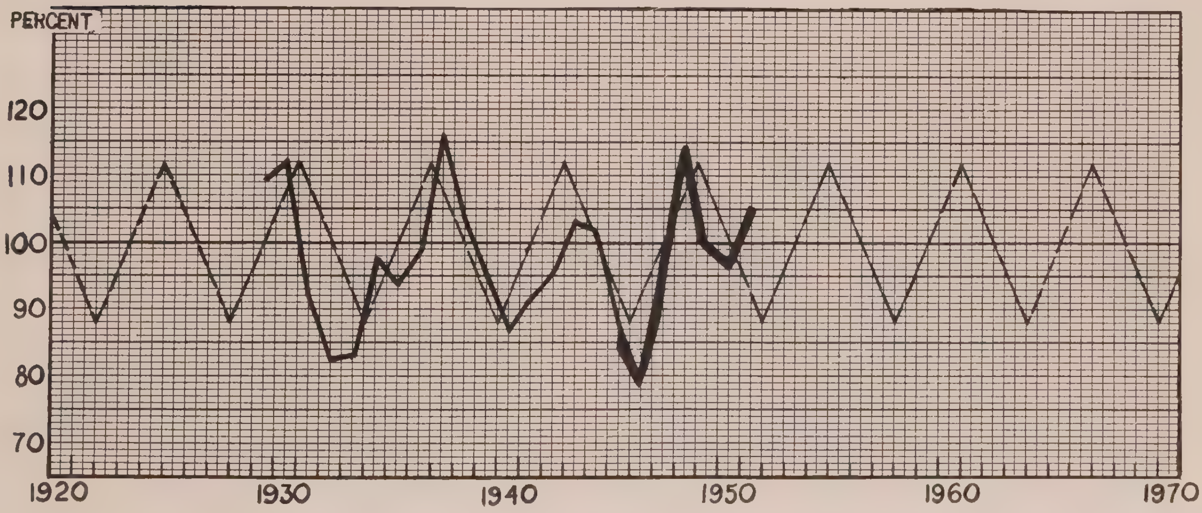


Fig. 2. The Six-Year Cycle in Standard Oil Company of California Gross Operating Income. Deviations of the actual sales from trend. Bold line shows how the forecast has worked out since this cycle was discovered. Broken zigzag line diagrams the 6-year cycle.

THE 6 YEAR CYCLE

IN

SWIFT AND COMPANY SALES

THE 6-year cycle in the sales of Swift and Company has been present—of course with distortions from 1892 to date. This cycle was discovered in 1949. It has an average strength of 12% above trend at time of crest, 12% below trend at time of trough. The current crest comes ideally midway between 1954 and 1955. This means that 1954 and 1955 should be about 8% above trend, 1956 should be on trend, and 1957 and 1958 should be about 8% below trend, if the 6-year cycle works out perfectly—but of course no cycle ever does.

Fig. 1 shows the typical and the idealized 6-year cycle in Swift and Company sales.

Fig. 2 shows actual sales, 1892—1954 and their 6-year moving average trend. The arrows are spaced at 6-year intervals to indicate ideal time of crest of the 6-year cycle. It is clear that the present cycle is pretty badly distorted. A peak came in 1951-52 just when we "should" have had a trough, and weakness came in 1954 just when we "should" have been having strength, according to the idea of regular 6-year cyclic behavior.

I suspect that the great increase in livestock values 1950 to 1952, and the drastic decline which followed, at least for sheep and cattle, may have had something to do with the distortion. (The per head value of cattle increased 44% from 1950 to 1952, decreased 48%, 1952 to 1954; the per head value of sheep increased 57% 1950 to 1952, decreased 50% 1952 to 1954: The per head value of hogs increased 10% 1950 to 1952. Hog values, however did not decrease from 1952 to 1954. They increased 22% more, thus partially offsetting the decrease in the price of cattle and sheep.)

Fig. 3 shows the percentages by which the actual sales were above or below trend. Percentages for the first three years and the last three years are lacking because the moving average trend cannot be completed to the very end of a series of figures.

The bold lines in both Fig. 2 and Fig. 3 show how events have unfolded since this cycle was first discovered. In spite of distortions it seems to me rather convincingly in favor of the argument that the 6-year cycle in these figures cannot easily be the result of accident.

E.R.D.

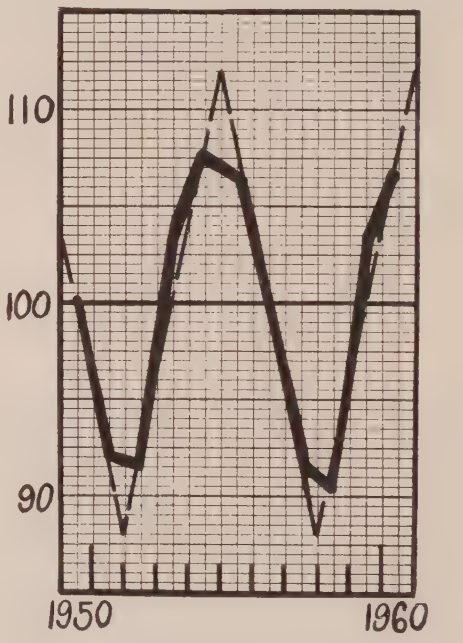


Fig. 1. The 6-Year Cycle in Swift and Company Sales.

Solid line, typical 6-year cycle.
Broken line, idealized 6-year cycle.

The ideal cycles goes up (or down) to a point between years because, if we had monthly figures, they would (presumably) continue the direction of the curve as determined by the two previous years.

However, whether they do or not makes no difference in forecasting annual values for the 12% above or below trend falls between years and therefore is never used.

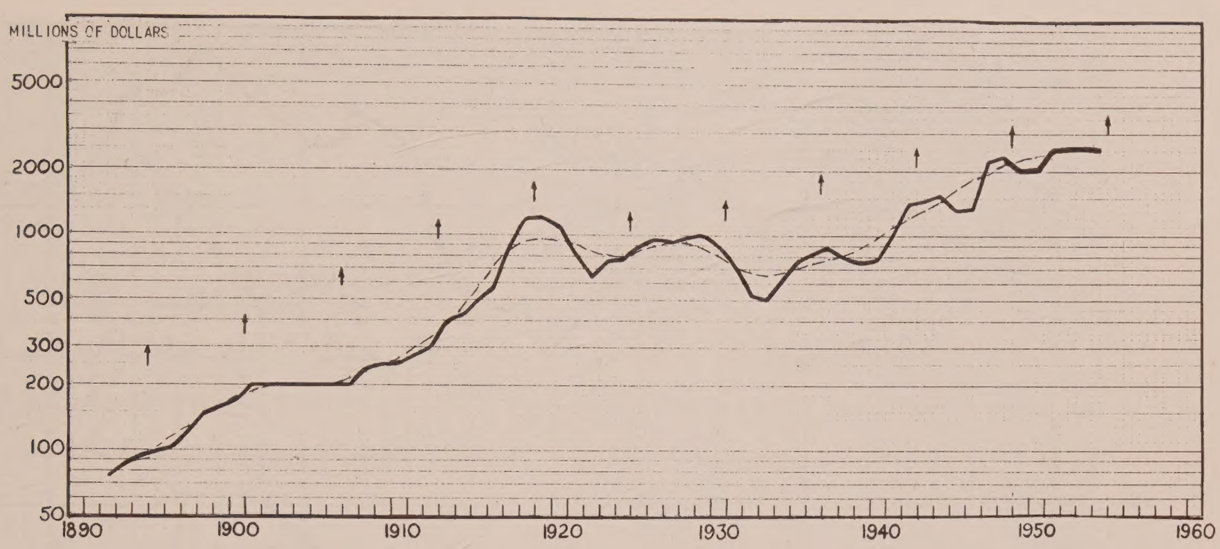


Fig. 1. Swift and Company Sales, 1892--1954, together with a six-year moving average trend. Arrows indicate time of ideal high of six-year cycle. Ratio Scale.

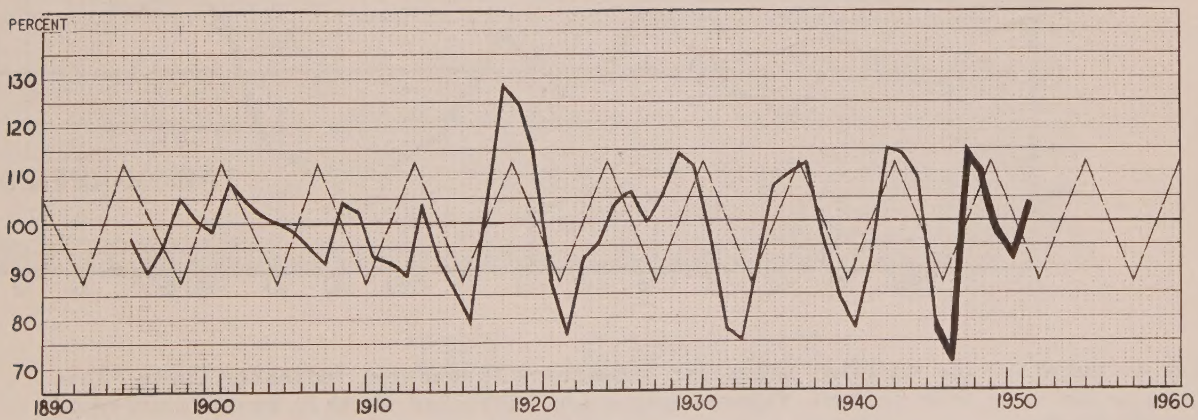


Fig. 2. The Six-Year Cycle in Swift and Company Sales. Deviations of the actual sales from trend. Bold line shows how the forecast has worked out since this cycle was discovered. Broken zigzag line diagrams the 6-year cycle.

THE MODIFIED GEISINGER INDICATOR

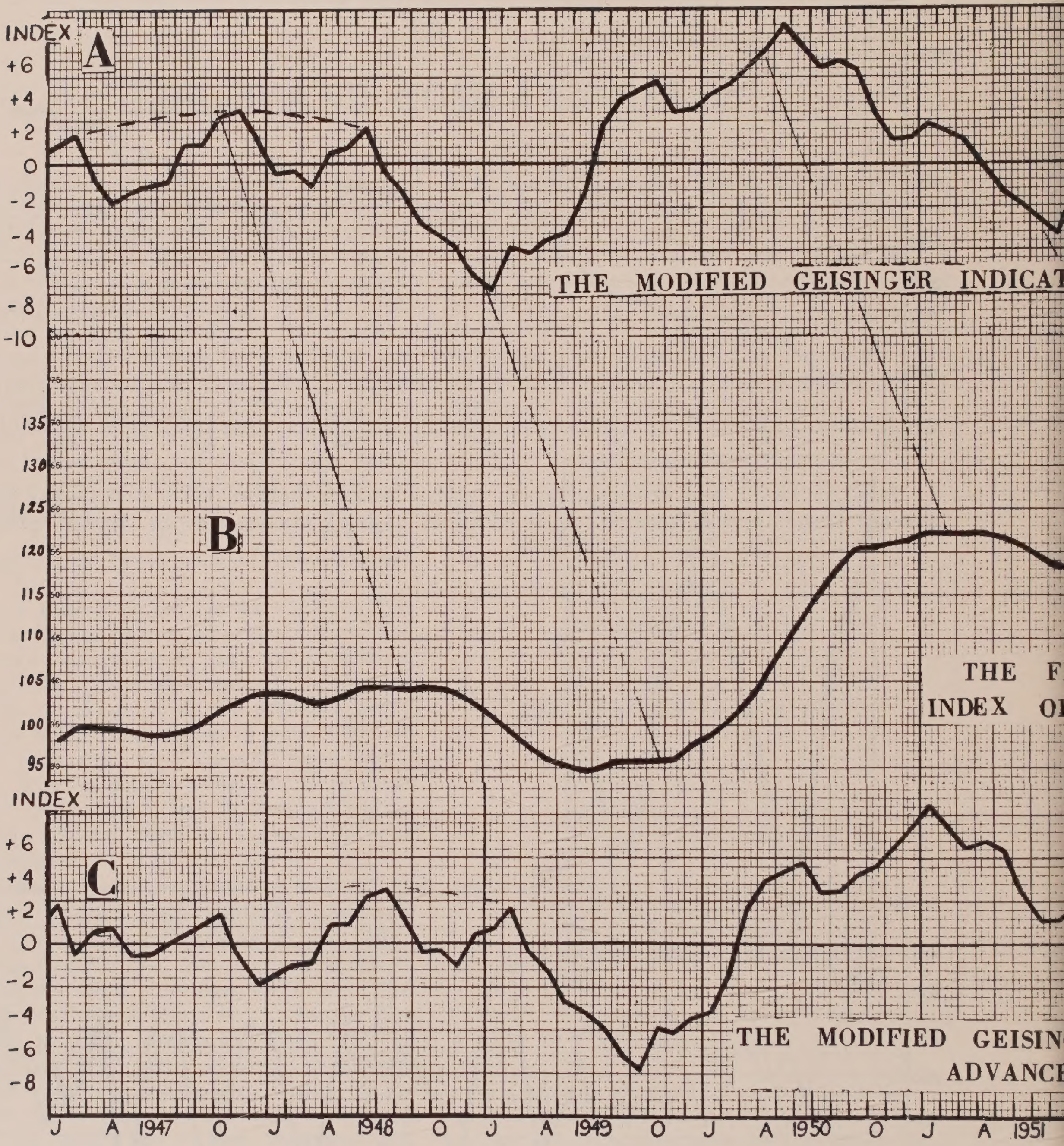
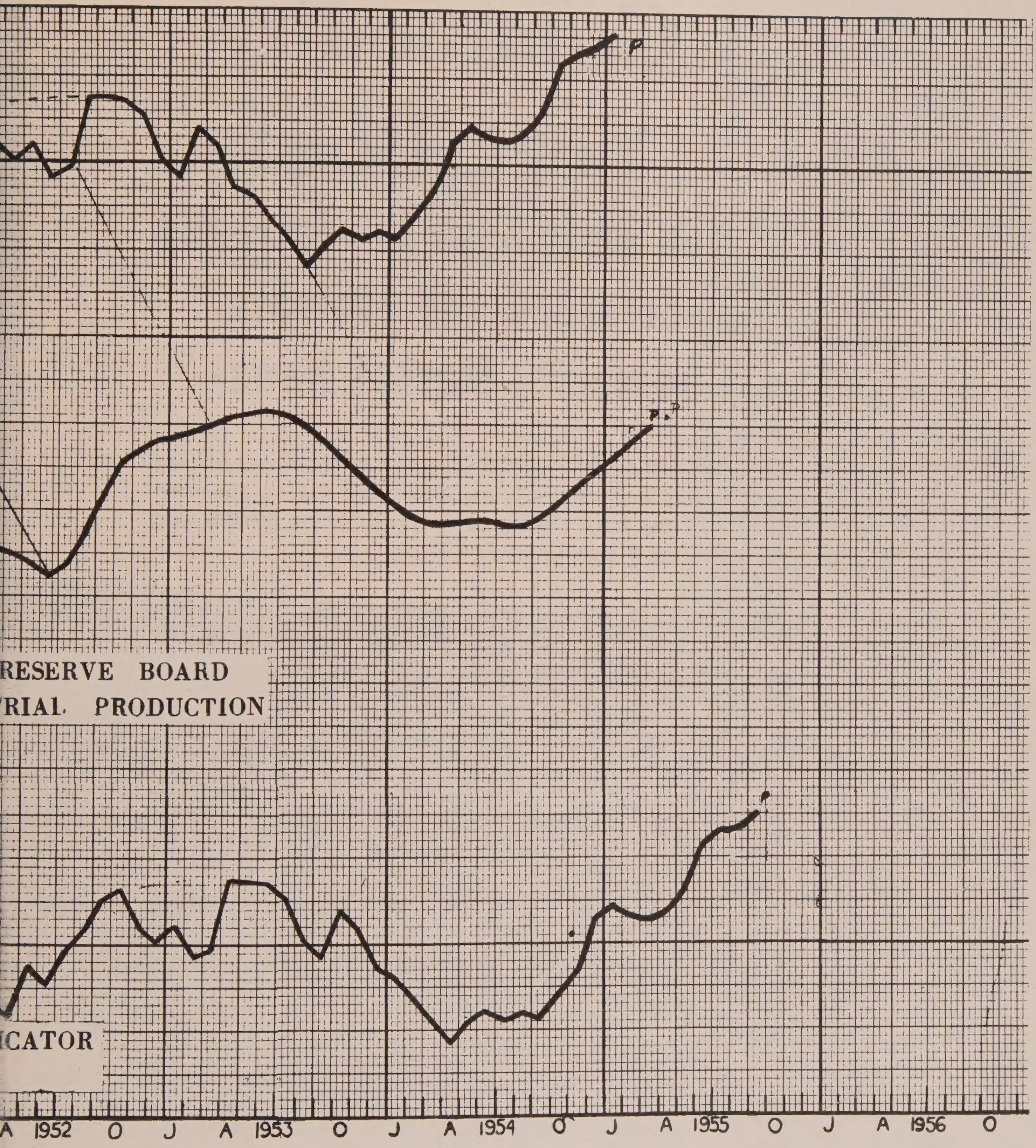


Fig. 1. Curve A. The Modified Geisinger Industrial Production Indicator Curve. This curve is derived from certain figures which are published monthly in the *Survey of Current Business*. It tends to turn about 8 months before the Federal Reserve Board Index of Industrial Production.

Curve B. The Federal Reserve Board Index of Industrial Production adjusted for seasonal variation and smoothed by a 3-month moving average. The value for the latest available month is shown by a dot.

Curve C. This Curve is the Modified Geisinger Industrial Production Indicator Curve advanced by 8 months. This process projects part of the curve into the future. If the relationships of the past continue, the projection gives some hint of what may happen to the Federal Reserve Board Index of Industrial Production (Curve B).

OF INDUSTRIAL PRODUCTION



THE FORECAST

Additional values which have become available since our May report went to press raise the provisional value of the Modified Geisinger Indicator of Industrial Production for December 1954 (August 1955 when projected) to a final value of 6.8. The revised provisional value for January 1955 (September when projected) is 7.7. This value is still provisional, as one component is still lacking. The final value, when available, could possibly be lower, but can not be higher.

Enough values are available for February 1955 (October 1955 when projected) to suggest that February values may be down slightly from the 7.7 value for January.

The Modified Geisinger Indicator, based on previous behavior, suggests continuing strength of the Federal Reserve Index of Industrial Production into the 4th quarter of 1955.

E.R.D.

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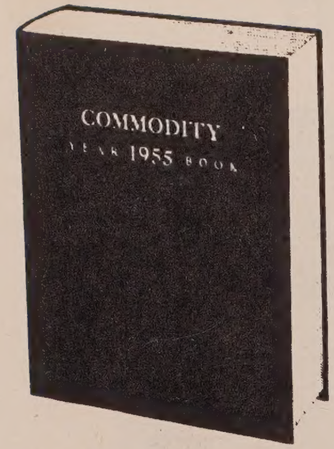

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